OIL RHEOLOGY ADJACENT TO THE SCRAPER RING OF A DIESEL ENGINE

by

DENNIS CHARLES LOGAN

B.S. Computer Science, University of Kansas
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ABSTRACT

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Submitted to the Department of Ocean Engineering in partial fulfillment of the requirements for the degrees of Master of Science in Naval Architecture/Marine Engineering and Master of Science in Mechanical Engineering.

ABSTRACT

Several recent experiments have been made to determine lubricant flow patterns in engine journal bearings. A laser fluorescence technique in use at the Massachusetts Institute of Technology allows accurate data collection of the oil film thickness on the ring pack of a production diesel engine. The data collected from the Kubota EA300N IDI engine consisted of five different types of lubricant--two single-grades, two multi-grades, and a synthetic multi-grade.

The data was analyzed and it was found that while oil cross-flow circumferentially around the scraper ring is not present in fired cases, it is present in the motored cases. In addition, oil flow under the ring was evaluated with results consistent with previous observations and the flows observed suggest that the oil flow is between the ring and liner. Finally, a model for upstrokes that predicts the inlet wetting height for varying ring load was evaluated with positive results.

Thesis Supervisor: Dr. David P. Hoult
Title: Senior Research Associate
Department of Mechanical Engineering

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I would like to dedicate this work to my wife, Lisa. Without her, my job as graduate student, husband and father of three young girls (two in diapers) would have been simply impossible. Her support was invaluable.

I am also grateful to Dr. Hoult for his guidance, patience and understanding during this research while I completed my primary master's degree in Ocean Engineering for the US Navy. Jim "Spud" Azzola also deserves recognition for editing this paper and for explaining all the complicated details in "sailor's" terms.

Many thanks to my mother-in-law, Peggy Volmar, for all her assistance in extreme times of need.

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CHAPTER 1 - INTRODUCTION

1.1 Background

This research is the continued analysis of the lubricant film thickness in the piston ring region of a small production diesel engine. Olechowski [1] and Hoult, Wong, and Azzola [5] have recently investigated the various rheological effects of single and multi-grade lubricants in the top ring region. This project investigates the scraper ring (second ring) region using similar analysis techniques as used for the top ring analysis.

One major goal of this research is to study fired data to expand the data base and to compare the results with the effects observed in the motored cases of the top ring. In addition, motored cases will be examined in the second ring analysis to note any anomalies between top ring and second ring observations.

The data used for this analysis was collected using a laser fluorescence technique. McElwee [2] and Bliven [3] measured film thicknesses in the ring pack region using single-grade and multi-grade oils. McElwee collected data using five different types of oil -- two single-grades, two multi-grades and a synthetic multi-grade. Bliven's measurements consisted of one single-grade and one multi-grade of the same type that McElwee analyzed. In all cases, various operating conditions (ie. speed, load) were established to observe any variations in lubricant behavior as a function of operating conditions.

The data was collected from a Kubota EA300N, a small, single cylinder 0.3 liter indirect diesel engine. One major difference between McElwee's experiments and Bliven's experiments is the azimuthal location that oil film thickness was measured. McElwee measured oil thickness on the wrist pin axis while Bliven

measured thickness on the antithrust side of the piston, approximately 65 degrees from McElwee's position. These two different measurements are important in the continued analysis of the oil flows in the piston ring region. The two different points of oil film measurement will play key roles in the determination of the boundary conditions upstream and downstream of each piston ring.

The three phenomena investigated here all pertain to the scraper ring. They are cross-flow, flow under the ring and load versus inlet wetting height.

1.2 Data Analysis Techniques

The analysis of data begins with the ring fits on computer generated oil traces as shown in figure 1. The ring fitting technique is an art at best and is described by McElwee [2] and Olechowski [1]. After placement of the ring, measurements for numerical computations where taken from the fitted data. Figure 2 shows the various ring and film thickness parameters required for the calculations.

One problem in analyzing the data was the fact that McElwee and Bliven used different film thickness calibration techniques [2,3]. This was accounted for by a temperature correction factor that was applied to McElwee's fired data. The correction factor was determined by a ratio of laser fluorescent efficiency at the various oil temperatures. The details of laser calibration are described by Hoult and Takiguchi [6]. McElwee's motored data and all of Bliven's data did not require a correction due to the dynamic (self-calibrating) calibration used in these cases.

The various constants and oil parameters used were taken from previous work and actual measurement. The scraper ring geometry was established using talysurf measurements of the actual ring used in both experiments. Appendix A describes the talysurf procedure used in determining the scraper ring parameters. The oil temperatures used in the fired analysis were obtained from Hartman [4] who determined cylinder liner temperatures under loaded conditions. With an oil

thickness of only a few microns, it is assumed that cylinder liner temperature is the most accurate measurement of oil temperature in the ring pack region. Motored oil temperatures were the same used by Olechowski [1].

The data base analyzed is shown in appendix B.

CHAPTER 2 - THEORY

2.1 Cross-flow

Cross-flow is the most straight forward of the three phenomena to analyze. A comparison of the minimum film thickness h_0 between the two azimuthal positions was used to determine the presence of cross-flow. Since approximate calculations (appendix C) showed that $h_0/h_\infty \sim 2$, the comparison of h_0 between positions is a proportional comparison of h_∞ at each location and thus gives an indication of flow from one position to the other.

2.2 Flow Under the Ring

Flow under the ring begins with the Reynolds flow equation as defined by Coyne and Elrod [7]:

$$Q = \frac{hU}{2} - \frac{h^3}{12\mu}\frac{dP}{dx}.$$

The boundary conditions here are:

1. ring load (W)
2. film thickness "far" away from the ring (h_∞)
3. h_0 or separation point at the exit (X_2)
4. known ring profile.

The nondimensional flow equation is obtained by using the standard nondimensional terms $\tilde{h}$, $\tilde{x}$ and $\tilde{P}$:

$$\tilde{h} = \frac{h}{h_\infty} \qquad \tilde{x} = \frac{x}{b} \qquad \tilde{P} = \frac{P h_o^2}{U \mu b}.$$

By substitution, the flow in nondimensional terms becomes:

$$\tilde{Q} = \frac{\tilde{h}}{2} - \frac{\tilde{h}^3}{12} \frac{d\tilde{P}}{d\tilde{x}} = \frac{Q}{h_o U}.$$

From conservation of mass (no sources), dQ/dx = 0 or $\tilde{Q}$ = a constant. Also, because of the relatively high velocity of the ring relative to cross-flow velocities, it seems a very good approximation to set $\tilde{Q} = 1$ under the ring. Therefore, the relationship between the entrance point (x =1) and exit point (x = 0) is

$$\frac{\tilde{h}(1)}{2} - \frac{\tilde{h}^3(1)}{12} \dot{\tilde{P}}(1) = \frac{\tilde{h}(0)}{2} - \frac{\tilde{h}^3(0)}{12} \dot{\tilde{P}}(0)$$

or

$$\frac{\tilde{h}(0)}{\tilde{h}(1)} = \frac{6 - \tilde{h}^2(1)\, \dot{\tilde{P}}(1)}{6 - \tilde{h}^2(0)\, \dot{\tilde{P}}(0)}$$

and the relationship between the entrance film thickness and h_∞ is

$$1 = \frac{\tilde{h}(1)}{2} - \frac{\tilde{h}^3(1)}{12} \frac{d\tilde{P}(1)}{d\tilde{x}}.$$

Flows under the ring were analyzed using the same computer programs as Bliven [3] and Hartman [4] used in their analysis.

2.3 Load versus Inlet Wetting

Similar to the top ring analysis [1,5], the variation in load versus inlet wetting height was investigated. The nondimensional load G is the same used by HWA [5] but normalized for the scraper ring (ie ΔPB for the scraper ring). G, the bearing number, is defined as follows:

$$G = \frac{\mu U b^2}{h_o^2 \Delta PB} = G(\Gamma_1, \Gamma_2, \widetilde{P}_2, \widetilde{P}_3)$$

where $\widetilde{P}_2$, $\widetilde{P}_3$ are the nondimensional pressures of the second and third lands respectively. To eliminate some of the variables it was determined that the pressure differences across the ring were small enough to disregard $\widetilde{P}_2$ and $\widetilde{P}_3$ for the compression and exhaust strokes. In addition, the assumption was made that Γ_2 always occurred, on upstrokes, at the sharp undercut tip of the scraper ring [9] with h_o and Γ_1 determined based on inputs b, Γ_2. The algorithm used to determine G for upstrokes is described in appendix C.

CHAPTER 3 - RESULTS

3.1 Cross-flow

Figures 3 and 4 show the plots of the wrist pin position h_0 (McElwee) versus the skirt position h_0 (Bliven) for a typical motored and fired case respectively. Figure 3 shows that the average value of h_0 (with standard deviation) is mostly above the 1:1 line which indicates that cross-flows are probable in the motored cases. Figure 4 shows a similar plot for a fired case with the values much closer to the 1:1 line. This is an indication that cross-flow is unlikely in the fired cases.

These results help define the boundary conditions in that differences in observed and calculated h_∞ could be due to cross-flows around the piston. Preliminary observations, in fact, show a difference of a factor of approximately two between h_∞ observed and h_∞ calculated. The cross-flow results provide more clues to the correct boundary conditions required to solve the flow problem. Additional plots are shown in appendix D.

3.2 Flow Under the Ring

Figure 5 shows the difference in oil flow rates between power (compression/expansion) and gas exchange (intake/exhaust) strokes for four fired and four motored cases along with the previous observations [3,8]. The results are consistent with previous observations which conclude that distinct oil recirculation loops appear to exist in the piston ring region and between the piston and the sump. The flow of oil under the second ring is part of the smaller ring region loop (the major loop is through the oil relief holes under the oil control ring that direct oil back to the sump). In addition, the oil transport rates are on the order of 10 to 100 times larger than oil consumption rates [4] which is consistent with previous observations.

There are three paths by which oil can reach the second land: flow through the ring gaps, flow around the backside of the ring and flow between the ring and the liner. Only flow between the ring and the liner is observed in this work. The fact that the flow between the ring and the liner, presented here, agrees with the flows to (from) the second land [8] strongly suggests that for the second land, the lubricant flow path is between the 2nd ring and the liner.

Additional condensed plots of flow segregating power strokes, gas exchange strokes and overall flow for the second and third lands are shown in appendix D.

3.3 Load versus Inlet Wetting Height

Figure 6 shows the correlation of the theoretical upstroke model with experimental data for fired cases. The model exhibits two branches which approximates the observed data fairly well. Figure 7 shows the plot of Γ_1 versus Γ_2 as a correlation with the upstroke model. The values of Γ_2 greater than one agree with the model to a high degree while the values close to one do not agree. For the values close to one, the outlet separation point is moving away from the undercut tip toward x_0 ($h(x_0) = h_0$) and is behaving similar to the top ring's outlet separation point. This is because above the undercut, the scraper ring has a circular profile similar to the top ring and thus top ring theory will apply when Γ_2 is close to one. Similar plots for the motored case are shown in appendix D.

CHAPTER 4 - CONCLUSIONS

The results of chapter 3 lead to the following conclusions concerning oil flow adjacent to the scraper ring:

1. Little or no cross-flow present in the fired case and probable cross-flows present in the motored case. These results provide a better understanding of the observed film heights observed away from the ring which allow more appropriate boundary conditions to be defined.

2. Oil flows under the ring are part of the ring region oil transport loop and are much larger than oil consumption rates which is consistent with previous observations. Also, the present results suggest that the flow to (from) the second land arises from flow between the ring and liner.

3. The relationship between load and inlet wetting height, as determined by the proposed upstroke model, is in good agreement with lubrication theory [9].

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FIGURES

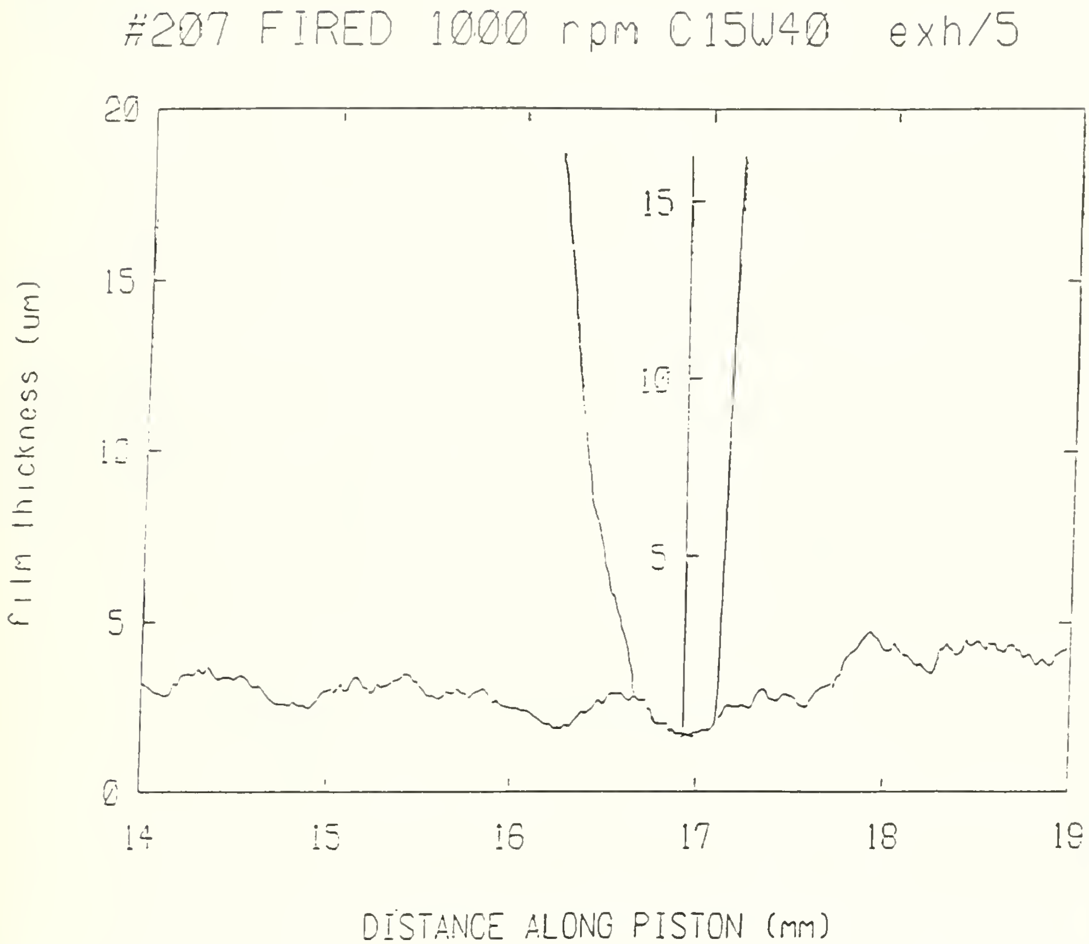
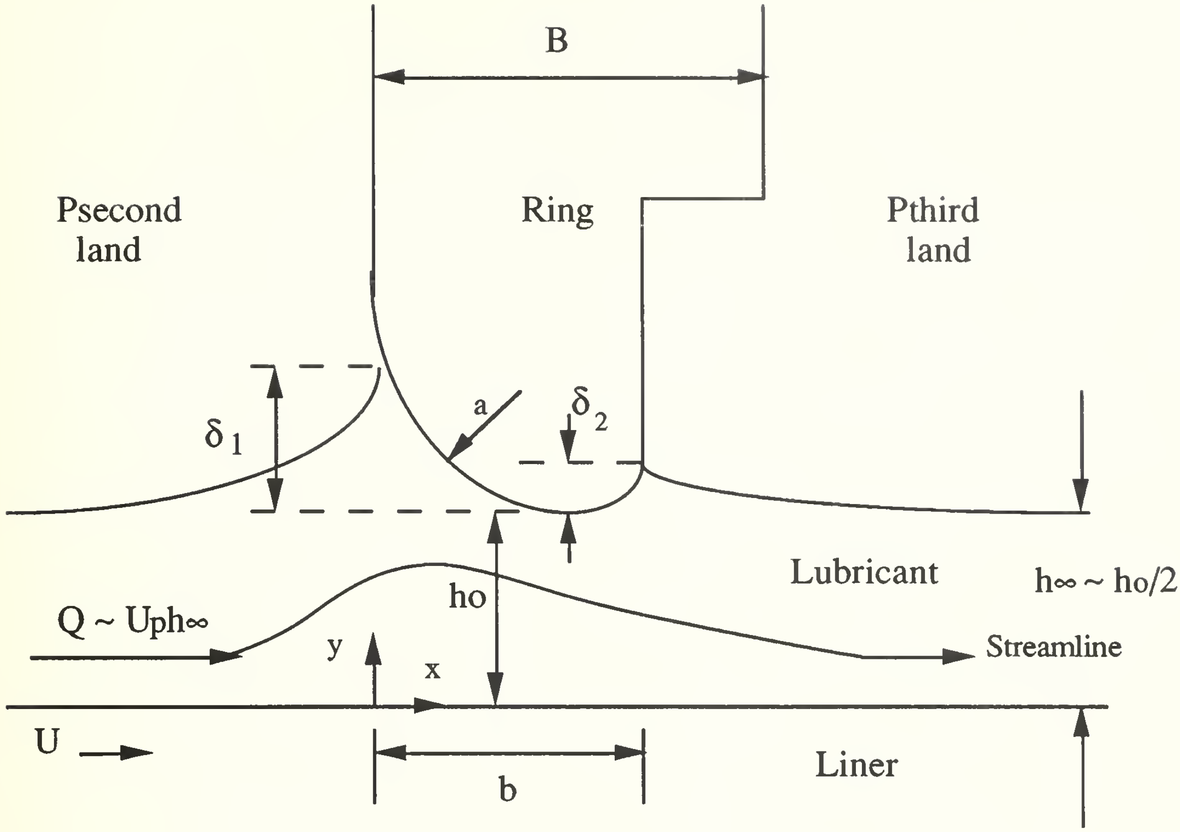


Figure 1 - General scraper ring fit on a computer generated oil trace



$$\Gamma_1 = \frac{\delta_1 + ho}{ho} \qquad \Gamma_2 = \frac{\delta_2 + ho}{ho}$$

Figure 2 - Definition of terms used in the solution of Reynolds flow equation under the scraper ring.

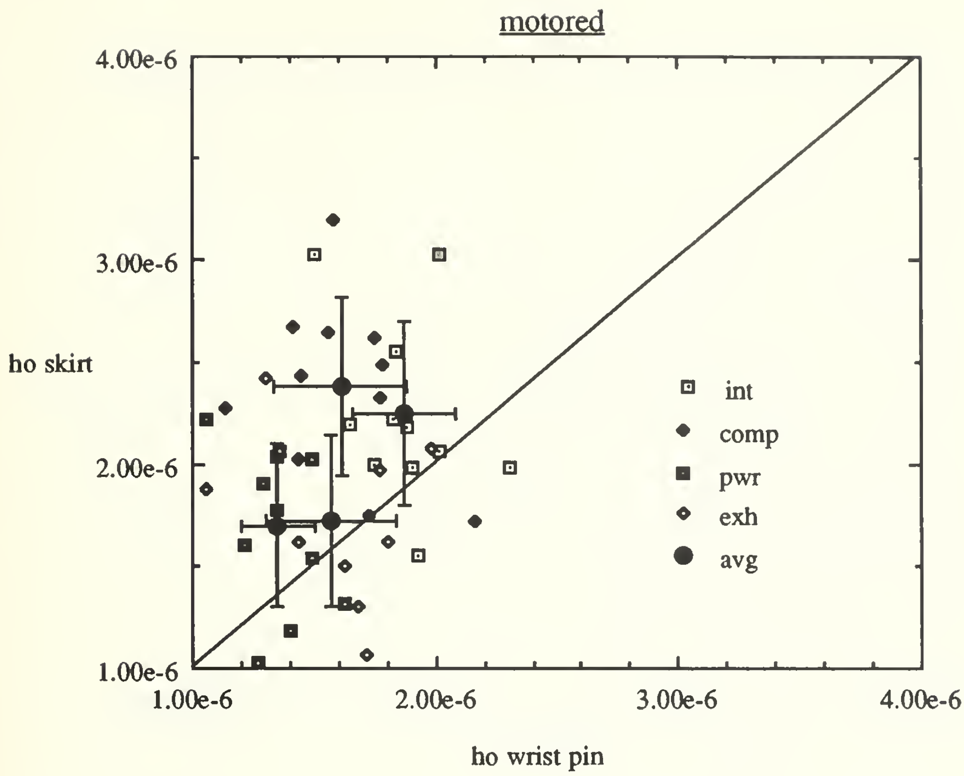


Figure 3 - Typical plot of minimum film thickness (ho) at each azimuthal location for a motored case (pen multi 3000 rpm). The average values indicate probable cross-flow from the skirt position to the wrist pin position in this motored case.

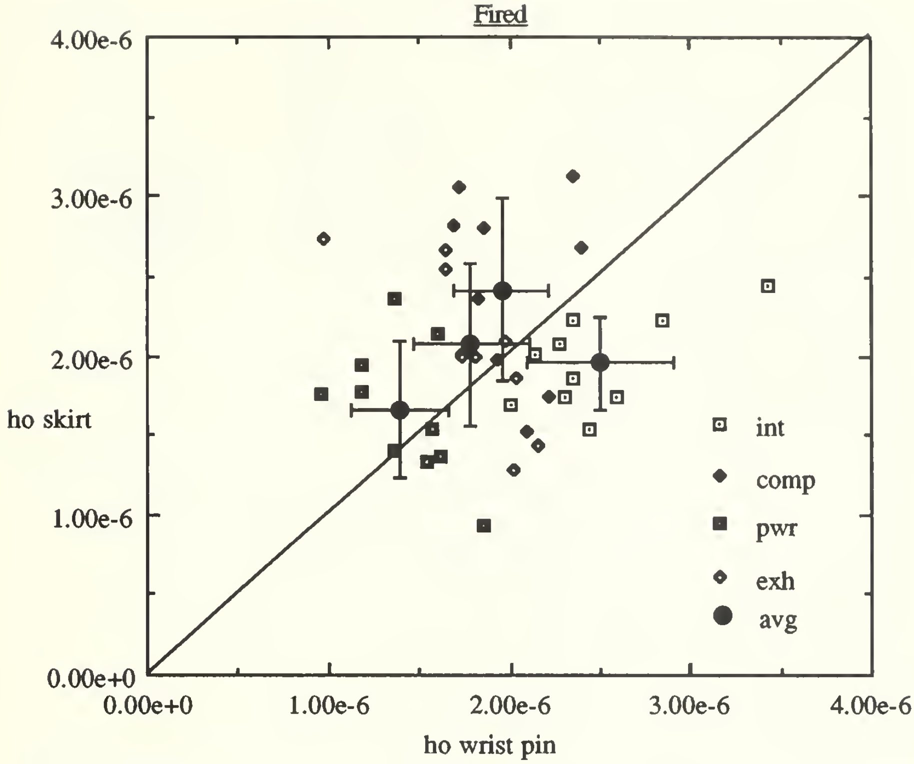
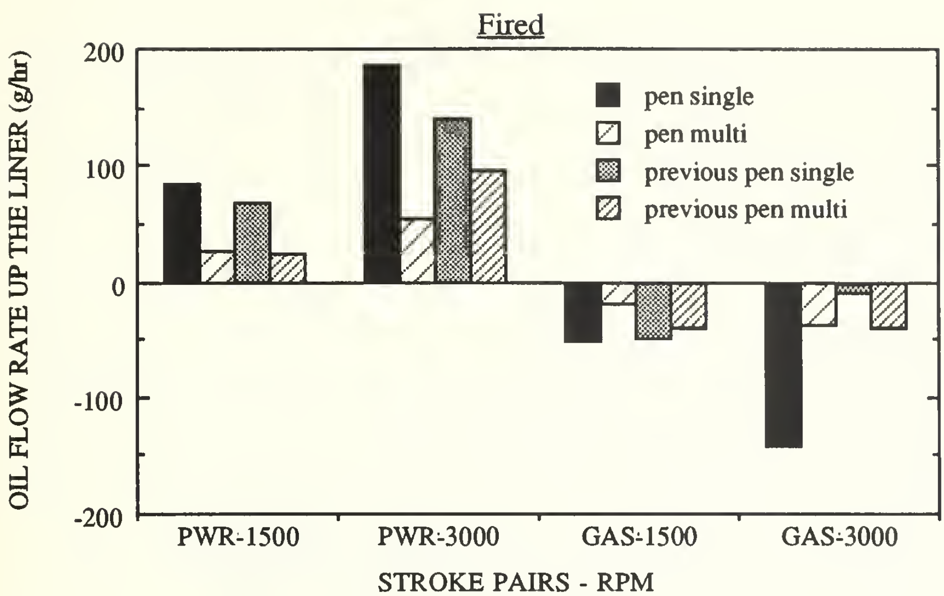


Figure 4 - Typical Plot of minimum film thickness (ho) at each azimuthal position for a fired case (pen single 1500 rpm). The average values indicate unlikely cross-flow in the fired case.



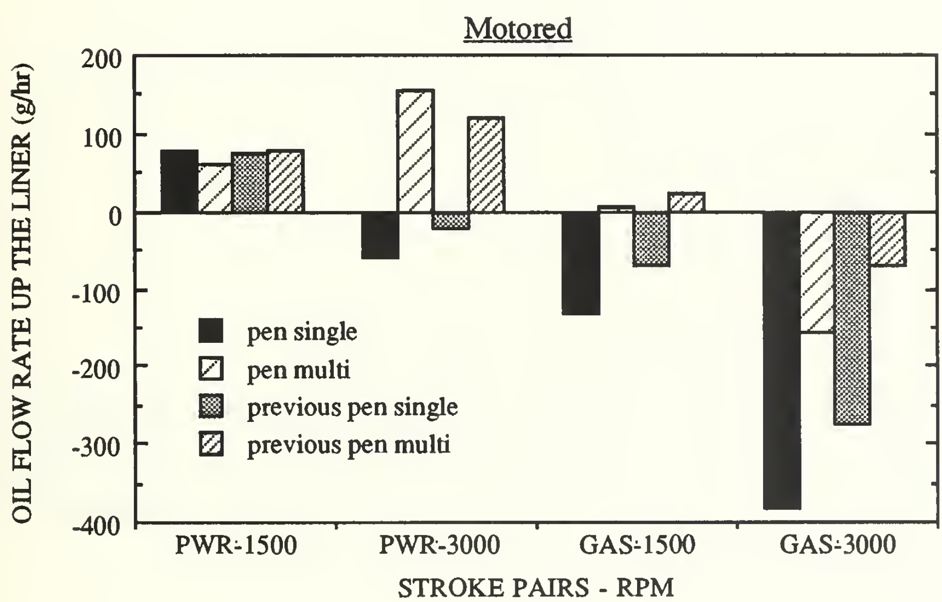


Figure 5 - Typical plots of oil flow rate comparisons of flow under the second ring for power (PWR) and gas exchange (GAS) strokes in fired and motored cases.

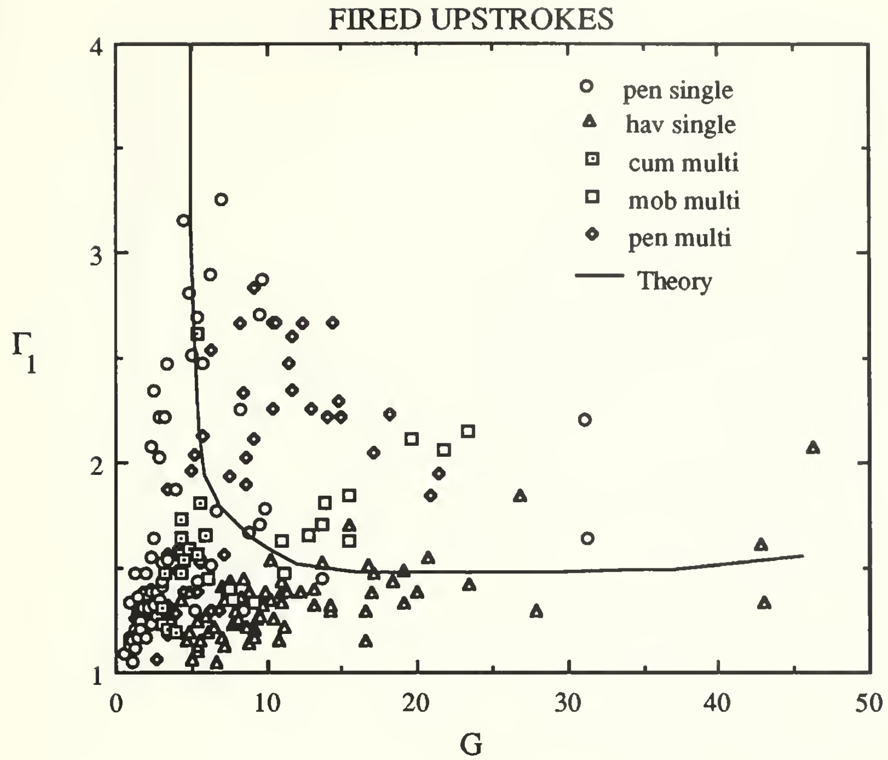


Figure 6 - Plot of nondimensional load G versus Γ_1 for fired upstrokes. The solid line represents the theoretical upstroke model which assumes the exit separation point (X2) is located at the undercut tip of the ring.

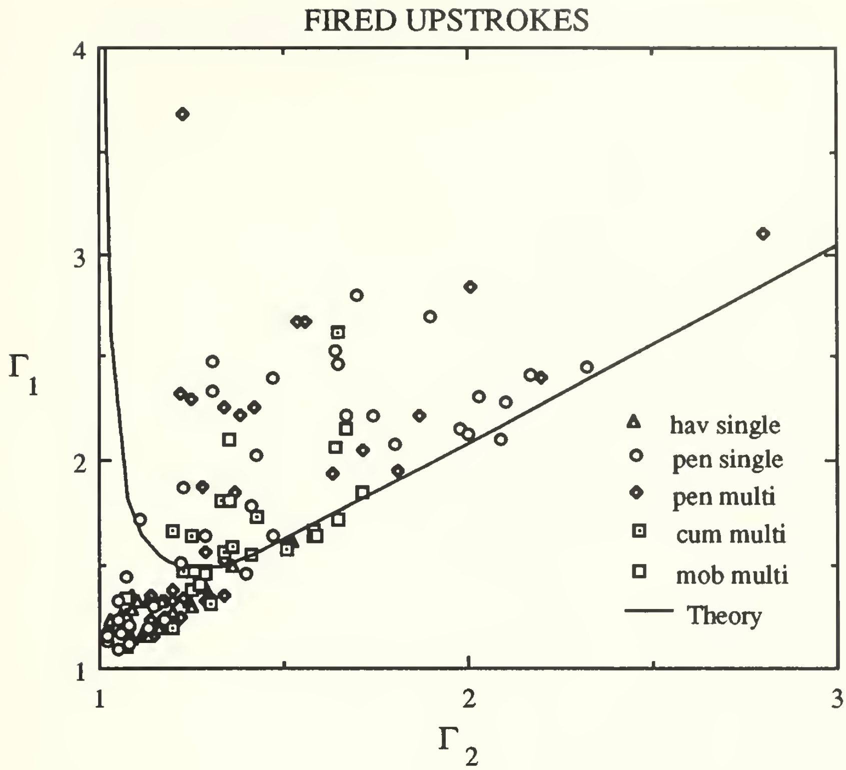
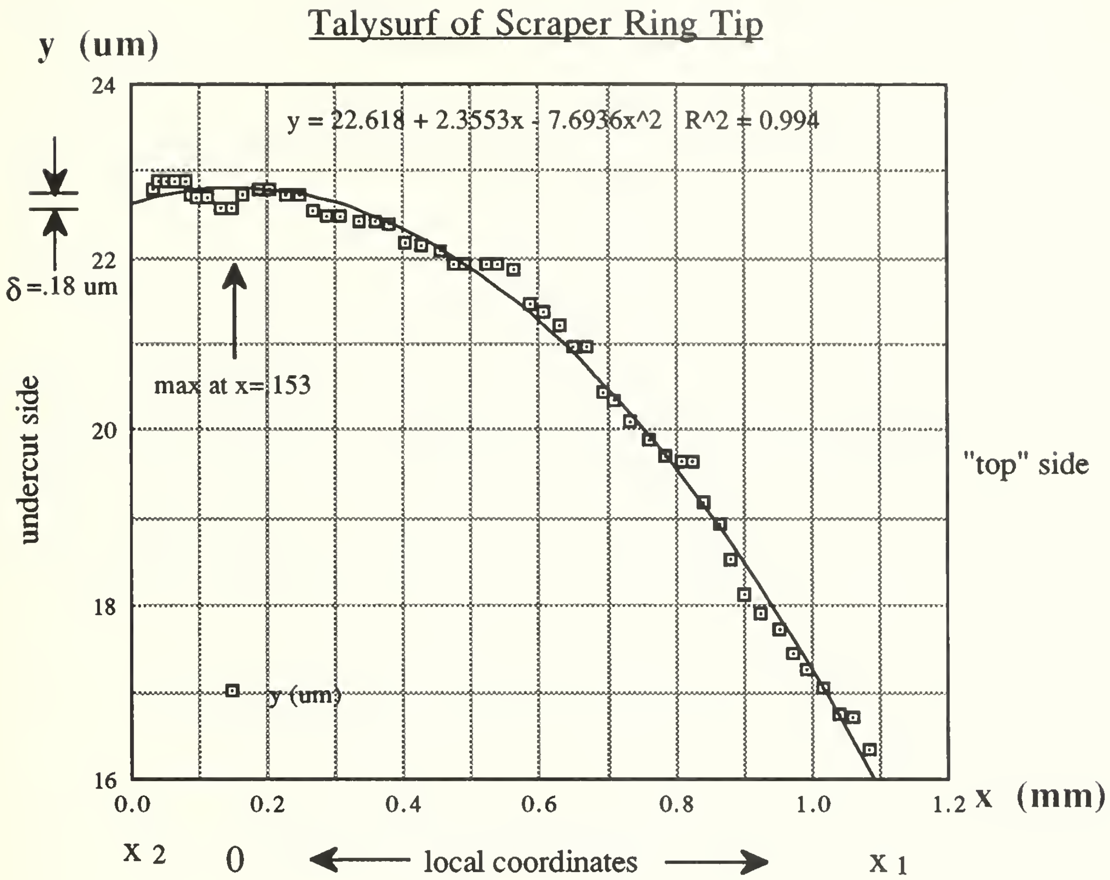
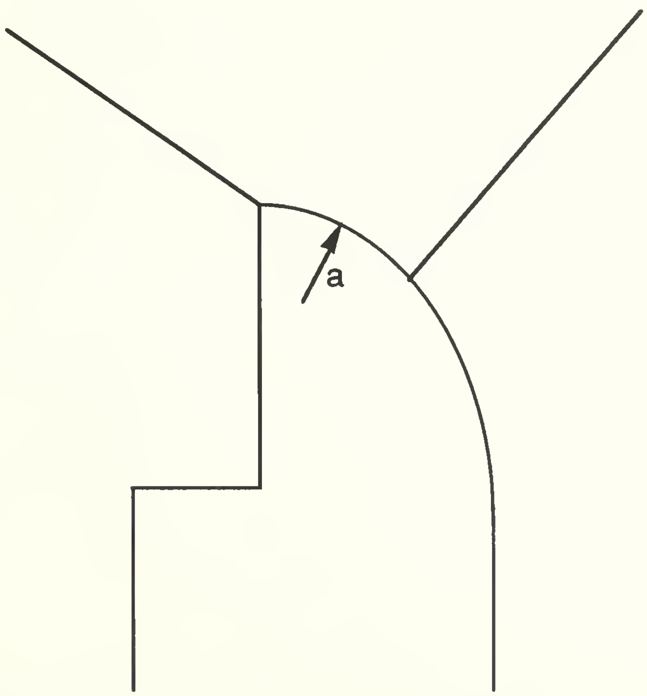


Figure 7 - Inlet height versus outlet height with the line representing the theoretical upstroke model.

Appendix A - Scraper Ring Talysurf Profile/Ring Tip Radius Calculation


Talysurf of Scraper Ring Tip
y (um)
y = 22.618 + 2.3553x - 7.6936x^2 R^2 = 0.994
δ=.18 um
max at x=.153
undercut side
"top" side
y (um)
24
22
20
18
16
0.0
0.2
0.4
0.6
0.8
1.0
1.2
x (mm)
x 2
0
local coordinates
x 1

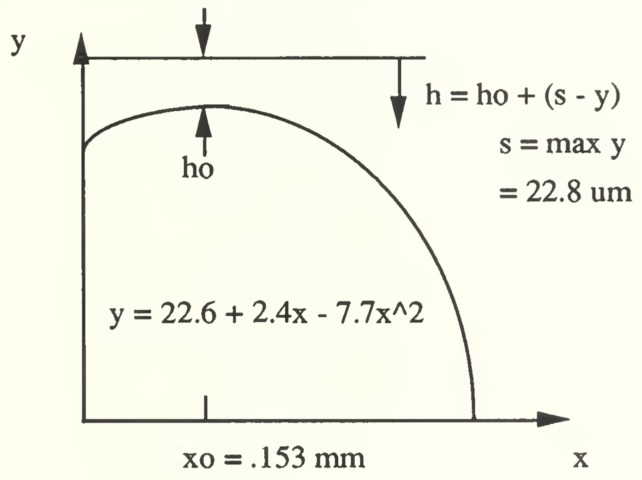

a

RING TIP RADIUS CALCULATION

The scraper ring tip, above the undercut, can be fit with a circular profile using a Taylor Series expansion of the equation of a circle around ho which gives:

$$h(x) = ho + \frac{(x-x_0)^2}{2a} \qquad (1)$$

where a is the radius of the circle. Since the arc of the circle used to describe the ring tip is small, it can also be described by the tip of a parabola. Therefore, expanding equation (1) and setting it equal to the oil film height equation as a function of the the ring tip (from the Talysurf plot), a can be found by matching any same term of each side of the equation. An example using the talysurf on the previous page is shown below.



$$y = c_1 + c_2 x + c_3 x^2$$

$$h = h_0 + (22.8 - c_1 - c_2 x - c_3 x^2) = h_0 + \frac{(x^2 + 2x_0 x + x_0^2)}{2a}$$

Matching the squared terms, we get

$$-c_3 = \frac{1}{2a}$$

or, using the parabolic fit terms, a = .065 m. This is the ring tip radius of a circular tip profile of the scraper ring.

Appendix B - Data Base Analyzed

Appendix B - Data Base Analyses

The data base used in this research was generated from experimental data taken by McElwee [2] and Bliven [3]. The data set numbers designate, among other things, which person took the data. Data sets numbered less than 500 were taken by McElwee and sets numbered 500 or greater were taken by Bliven. The cross-flow analysis data base used two oils at two different speeds each since Bliven only worked with two oils which were a subset of the five oils analyzed. The load versus inlet wetting height data base was generated using a cross-section of all five oils at five speeds. The cross-flow data base is shown in table 1. The load versus inlet wetting height data base is shown in table 2.

The actual data base is shown in the rest of appendix B. Each data set is stored in an Excel spreadsheet and saved on floppy disks. The name used to save each data set is coded as follows:

Character #	Translation
1	ring (S=second)
2	data (B=Bliven, M=McElwee)
3	oil (P=Pennzoil, H=Havoline, C=Cummins, M=Mobil1)
4	type (S=single-grade, M=multi-grade)
5,6	speed (add two zeros to this number, ie 25=2500)
7	load (H=half load, F=full load).

Motored data sets are also distinguishable by a ".X" at the end of the name.

Two different types of measurements were used when collecting the data. Initially, a digitizer was used to measure each point on a particular oil trace. This is shown by columns in a particular spreadsheet labeled x1, x2, x3, y1, y2, y3 (1=inlet, 2=minimum oil height points, 3=exit). The x values (distance along piston) are mm and the y values (oil height) are um. These values were taken straight off of the oil traces and entered as dimensional values. Since this procedure required extensive amounts of time, a second method was devised using an engineer's ruler on the 30 divisions/inch scale measuring the number of tick marks (divisions) for a particular point and then scaling the length with the x or y axis as given on each oil trace. The spreadsheet columns using this procedure are designated b ticks (only one measurement required to obtain b), h1, h2 or h3 ticks (the oil height measured in ruler divisions where 1,2,3 have the same meaning as above). These values were then scaled according to the x or y axis scale.

The various fired and motored data constants used in the calculations are stored in separate spreadsheets. These are shown at the end of appendix B.

	Data Set #	Oil	Speed (rpm)
Fired (all full load)	359	Pennzoil 15W40	1500
F	368	Pennzoil 15W40	3000
F	409	Pennzoil SAE30	1500
F	418	Pennzoil SAE30	3000
F	521	Pennzoil 15W40	1500
F	522	Pennzoil 15W40	3000
F	526	Pennzoil SAE30	1500
F	527	Pennzoil SAE30	3000
Motored	352	Pennzoil 15W40	1500
M	355	Pennzoil 15W40	3000
M	402	Pennzoil SAE30	1500
M	405	Pennzoil SAE30	3000
M	519	Pennzoil 15W40	1500
M	520	Pennzoil 15W40	3000
M	524	Pennzoil SAE30	1500
M	525	Pennzoil SAE30	3000

Table 1 - Cross-flow Data Base

	Data Set #	Oil	Speed (rpm)	Load
Fired	207	Cummins 15W40	1000	full
F	258	Havoline SAE30	1000	half
F	263	Havoline SAE30	2000	full
F	268	Havoline SAE30	2500	half
F	306	Mobil1 15W50	1000	full
F	521	Pennzoil 15W40	1500	full
F	522	Pennzoil 15W40	3000	full
F	526	Pennzoil SAE30	1500	full
F	527	Pennzoil SAE30	3000	full
Motored	203	Cummins 15W40	2000	n/a
M	251	Havoline SAE30	1000	n/a
M	254	Havoline SAE30	2500	n/a
M	303	Mobil1 15W50	2000	n/a
M	519	Pennzoil 15W40	1500	n/a
M	520	Pennzoil 15W40	3000	n/a
M	524	Pennzoil SAE30	1500	n/a
M	525	Pennzoil SAE30	3000	n/a

Table 2 - Load versus Inlet Wetting Height Data Base

	A	B	C	D	E	F	G	H	I	J	K
1	SMPM15F										
2											
3	stroke	b ticks	h1 ticks	ho ticks	h2 ticks	b (m)	ho (m)	gam1	gam2	oil thickness	ho (m)
4	int1	0.99	1.47	1.19	1.42	0.00025641	1.74E-06	1.24	1.19	correction	2.60E-06
5	int3	1.22	1.43	1.13	1.37	0.00031596	1.65E-06	1.27	1.21	factor applied	2.66E-06
8	int5	0.95	1.37	1.24	1.35	0.00024605	1.81E-06	1.10	1.09	--------->	2.91E-06
7	int7	0.95	1.66	1.35	1.53	0.00024605	1.97E-06	1.24	1.13	--------->	3.17E-06
8	int9	0.94	2.09	1.72	1.87	0.00024346	2.51E-06	1.22	1.09	--------->	4.04E-06
9	int11	1.07	1.75	1.3	1.6	0.00027713	1.90E-06	1.35	1.23	--------->	3.06E-06
10	int13	0.98	1.52	1.14	1.3	0.00025382	1.66E-08	1.33	1.14	--------->	2.66E-06
11	int15	0.99	1.77	1.38	1.5	0.00025641	2.01E-06	1.26	1.09	--------->	3.24E-06
12	int17	1.16	1.45	1.16	1.36	0.00030044	1.69E-06	1.25	1.19	--------->	2.73E-06
13	int19	0.89	1.87	1.52	1.7	0.00023051	2.22E-06	1.23	1.12	--------->	3.57E-06
14	int21	1.07	1.36	1.09	1.28	0.00027713	1.59E-06	1.27	1.17	--------->	2.56E-06
15											
16	comp2	1.22	1.25	0.95	1.14	0.00031598	1.39E-08	1.32	1.20	--------->	2.23E-06
17	comp4	1.1	0.93	0.69	0.79	0.0002849	1.01E-06	1.35	1.14	--------->	1.62E-06
18	comp6	1.19	1.26	0.91	1.09	0.00030821	1.33E-08	1.38	1.20	--------->	2.14E-08
19	comp8	1.18	1.34	1.02	1.18	0.00030562	1.49E-08	1.31	1.16	--------->	2.40E-06
20	comp10	1.2	1.15	0.92	1.12	0.0003108	1.34E-06	1.25	1.22	--------->	2.16E-06
21	comp12	1.14	1	0.74	0.99	0.00029526	1.06E-06	1.35	1.34	--------->	1.74E-06
22	comp14	1.22	1.18	0.95	1.15	0.00031598	1.39E-06	1.24	1.21	--------->	2.23E-06
23	comp16	1.29	1.15	0.86	1.12	0.00033411	1.26E-06	1.34	1.30	--------->	2.02E-06
24	comp16	1.31	1.13	0.72	1.09	0.00033929	1.05E-06	1.57	1.51	--------->	1.69E-06
25	comp20	1.46	1.16	0.74	1.12	0.00036332	1.06E-06	1.59	1.51	--------->	1.74E-06
28	comp22	1.31	1.31	0.99	1.28	0.00033929	1.45E-08	1.32	1.29	--------->	2.33E-06
27											
28	pwr2	0.97	0.8	0.56	0.61	0.00025123	8.18E-07	1.43	1.09	--------->	1.32E-06
29	pwr4	1.19	0.99	0.62	0.89	0.00030621	9.05E-07	1.60	1.44	--------->	1.46E-06
30	pwr6	1.2	0.98	0.59	0.82	0.0003108	8.61E-07	1.66	1.39	--------->	1.39E-06
31	pwr8	0.96	0.86	0.72	0.65	0.00025362	1.05E-06	1.22	1.18	--------->	1.69E-06
32	pwr10	1.18	0.75	0.58	0.71	0.00030562	8.47E-07	1.29	1.22	--------->	1.36E-06
33	pwr12	1	0.97	0.69	0.79	0.000259	1.01E-06	1.41	1.14	--------->	1.62E-06
34	pwr14	1.06	0.7	0.5	0.65	0.00027454	7.30E-07	1.40	1.30	--------->	1.18E-06
35	pwr16	0.96	0.92	0.71	0.72	0.00024864	1.04E-06	1.30	1.01	--------->	1.67E-06
36	pwr16	0.91	0.62	0.69	0.76	0.00023569	1.01E-06	1.19	1.13	--------->	1.62E-06
37	pwr20	1.07	0.76	0.6	0.71	0.00027713	6.76E-07	1.30	1.16	--------->	1.41E-06
38	pwr22	0.96	1.1	0.92	1.02	0.00024864	1.34E-06	1.20	1.11	--------->	2.16E-06
39											
40	exh1	1.19	1.21	1.01	1.09	0.00030	1.45E-06	1.20	1.06	--------->	2.342E-06
41	exh3	1.25	1.14	0.93	1.06	0.00032	1.34E-06	1.23	1.14	--------->	2.156E-06
42	exh5	1.14	1.07	0.88	1.15	0.00029	1.27E-06	1.22	1.31	--------->	2.04E-06
43	exh7	1.23	1.21	0.92	1.09	0.00031	1.32E-06	1.32	1.18	--------->	2.133E-06
44	exh9	1.21	1.27	1.02	1.21	0.00031	1.47E-06	1.25	1.19	--------->	2.385E-06
45	exh11	1.06	1.28	1.1	1.26	0.00027	1.58E-08	1.16	1.15	--------->	2.55E-06
48	exh13	1.28	0.85	0.56	0.75	0.00033	8.06E-07	1.52	1.34	--------->	1.298E-06
47	exh15	1.2	1.13	0.61	1.03	0.00031	1.17E-06	1.40	1.27	--------->	1.876E-06
48	exh17	1.26	1.06	0.79	0.97	0.00032	1.14E-08	1.34	1.23	--------->	1.832E-06
49	exh19	1.26	1.43	1.16	1.37	0.00032	1.7E-06	1.21	1.16	--------->	2.736E-06
50	exh21	1.22	1.36	1.09	1.29	0.00031	1.57E-06	1.25	1.18	--------->	2.527E-06

	A	B	C	D	E	F	G	H	I	J	K
1	SMPM30F										
2											
3	stroke	b ticks	h1 ticks	ho ticks	h2 ticks	b (m)	ho (m)	gam1	gam2	oil thickness	ho (m)
4	comp2	1.24	0.62	0.63	0.75	0.00032116	9.196E-07	1.30	1.19	correction	1.4257E-06
5	comp4	1.02	0.89	0.64	0.74	0.00026418	9.344E-07	1.39	1.16	factor applied	1.4483E-06
6	comp6	1.3	0.69	0.69	0.66	0.0003367	1.0074E-06	1.29	1.26	--------->	1.5615E-06
7	comp6	1.16	1.08	0.83	0.92	0.00030044	1.2118E-06	1.30	1.11	--------->	1.8783E-06
8	comp10	1.18	0.97	0.6	0.87	0.00030562	1.168E-06	1.21	1.09	--------->	1.6104E-06
9	comp12	1.21	1.15	0.87	1	0.00031339	1.2702E-06	1.32	1.15	--------->	1.9688E-06
10	comp14	1.22	1.04	0.61	0.9	0.00031598	1.1626E-06	1.26	1.11	--------->	1.633E-06
11	comp16	0.83	1.11	1	1.07	0.00021497	0.00000146	1.11	1.07	--------->	2.263E-06
12	comp16	1	0.84	0.71	0.8	0.000259	1.0366E-06	1.16	1.13	--------->	1.6067E-06
13	comp20	1.2	0.96	0.69	0.85	0.0003108	1.0074E-06	1.39	1.23	--------->	1.5615E-06
14	comp22	0.83	0.72	0.66	0.7	0.00021497	9.926E-07	1.06	1.03	--------->	1.5366E-06
15											
16	pwr2	0.88	0.49	0.39	0.45	0.00022792	5.694E-07	1.26	1.15	--------->	8.8257E-07
17	pwr4	0.95	0.59	0.49	0.54	0.00024605	7.154E-07	1.20	1.10	--------->	1.1089E-06
18	pwr6	0.97	0.56	0.47	0.49	0.00025123	6.862E-07	1.23	1.04	--------->	1.0636E-06
19	pwr8	1.03	0.61	0.51	58	0.00026677	7.446E-07	1.20	113.73	--------->	1.1541E-06
20	pwr10	0.96	0.58	0.48	0.53	0.00024664	7.006E-07	1.21	1.10	--------->	1.0862E-06
21	pwr12	0.95	0.54	0.39	0.49	0.00024605	5.694E-07	1.38	1.26	--------->	6.6257E-07
22	pwr14	0.93	0.66	0.53	0.59	0.00024087	7.738E-07	1.25	1.11	--------->	1.1994E-06
23	pwr16	0.69	0.81	0.72	0.76	0.00023051	1.0512E-06	1.13	1.06	--------->	1.6294E-06
24	pwr16	0.96	0.56	0.49	0.5	0.00025362	7.154E-07	1.14	1.02	--------->	1.1069E-06
25	pwr20	0.99	0.59	0.43	0.58	0.00025641	6.278E-07	1.37	1.35	--------->	9.7309E-07
26	pwr22	0.92	0.51	0.41	0.5	0.00023828	5.986E-07	1.24	1.22	--------->	9.2783E-07

	A	B	C	D	E	F	Q	H	I	J	K
1	SMPS15F										
2											
3	stroke	b ticks	h1 ticks	ho ticks	h2 ticks	b (m)	ho (m)	gam1	gam2	oil thickness	ho (m)
4	int2	1.04	1.37	1.1	1.26	0.00026936	1.61E-06	1.25	1.16	correction	2.59E-06
5	int4	0.94	1.07	0.85	0.98	0.00024346	1.24E-06	1.26	1.15	factor applied	2.00E-06
8	int6	1	1.15	0.98	1.08	0.000259	1.43E-06	1.17	1.10	--------->	2.30E-06
7	int8	1.12	1.22	1	1.14	0.00029008	1.46E-06	1.22	1.14	--------->	2.35E-06
8	int10	0.98	1.28	1.04	1.16	0.00025382	1.52E-06	1.21	1.12	--------->	2.44E-06
9	int12	1.01	1.52	1.46	1.47	0.00026159	2.13E-06	1.04	1.01	--------->	3.43E-06
10	int14	1.06	1.2	1	1.16	0.00027454	1.46E-06	1.20	1.16	--------->	2.35E-06
11	int16	1	1.48	1.21	1.27	0.000259	1.77E-06	1.22	1.05	--------->	2.84E-06
12	int18	1.02	1.28	0.91	1.04	0.00026418	1.33E-06	1.41	1.14	--------->	2.14E-08
13	int20	0.97	1.14	0.97	1.09	0.00025123	1.42E-06	1.16	1.12	--------->	2.26E-06
14	int22	1.07	1.52	1.17	1.3	0.00027713	1.71E-06	1.30	1.11	--------->	2.75E-06
15											
16	comp1	1.25	1.2	1.02	1.13	0.00032375	1.49E-06	1.18	1.11	--------->	2.40E-06
17	comp3	1.2	1.21	0.82	0.96	0.0003108	1.20E-08	1.48	1.17	--------->	1.93E-08
18	comp5	0.9	0.98	0.72	0.79	0.0002331	1.05E-06	1.38	1.10	--------->	1.69E-06
19	comp7	1.2	1.2	0.94	1.09	0.0003106	1.37E-06	1.28	1.16	--------->	2.21E-06
20	comp9	1.29	1.29	1	1.14	0.00033411	1.48E-06	1.29	1.14	--------->	2.35E-06
21	comp11	1.35	1.1	0.79	1	0.00034965	1.15E-06	1.39	1.27	--------->	1.66E-06
22	comp13	1.16	1.03	0.74	0.86	0.00030044	1.08E-06	1.39	1.16	--------->	1.74E-06
23	comp15	1.28	1.03	0.78	0.98	0.00033152	1.14E-06	1.32	1.26	--------->	1.83E-06
24	comp17	1.31	1.11	0.73	0.92	0.00033929	1.07E-06	1.52	1.26	--------->	1.72E-06
25	comp19	1.06	1.32	0.69	1.03	0.00027454	1.30E-06	1.48	1.16	--------->	2.09E-06
26	comp21	1.17	1.13	0.73	0.62	0.00030303	1.07E-06	1.55	1.12	--------->	1.72E-06
27											
28	pwr1	0.96	0.89	0.66	0.7	0.00025382	9.93E-07	1.31	1.03	--------->	1.60E-06
29	pwr3	0.94	0.72	0.56	0.64	0.00024346	8.47E-07	1.24	1.10	--------->	1.36E-06
30	pwr5	1.03	0.73	0.5	0.59	0.00026677	7.30E-07	1.46	1.18	--------->	1.16E-06
31	pwr7	0.97	0.91	0.66	0.78	0.00025123	9.64E-07	1.38	1.18	--------->	1.55E-06
32	pwr9	1.03	0.99	0.67	0.71	0.00026677	9.78E-07	1.48	1.06	--------->	1.57E-06
33	pwr11	0.96	0.63	0.41	0.57	0.00025382	5.99E-07	1.54	1.39	--------->	9.84E-07
34	pwr13	1.2	0.77	0.5	0.86	0.0003108	7.30E-07	1.54	1.32	--------->	1.18E-06
35	pwr15	0.97	0.81	0.69	0.8	0.00025123	1.01E-06	1.17	1.16	--------->	1.82E-06
38	pwr17	0.99	0.68	0.79	0.8	0.00025641	1.15E-06	1.11	1.01	--------->	1.66E-06
37	pwr19	0.95	0.71	0.56	0.61	0.00024605	6.47E-07	1.22	1.05	--------->	1.36E-06
38	pwr21	0.93	0.62	0.48	0.8	0.00024087	7.01E-07	1.29	1.25	--------->	1.13E-08
39											
40	exh2	1.31	1.22	0.93	1.14	0.00034	1.3392E-06	1.31	1.23	--------->	2.16E-06
41	exh4	1.18	0.92	0.75	0.89	0.00030	0.00000108	1.23	1.19	--------->	1.74E-06
42	exh6	1.34	1.2	0.88	1.11	0.00034	1.2672E-06	1.36	1.26	--------->	2.04E-06
43	exh6	0.86	1.02	0.87	1.01	0.00022	1.2526E-06	1.17	1.16	--------->	2.02E-06
44	exh10	1.29	0.7	0.42	0.63	0.00033	6.048E-07	1.67	1.50	--------->	9.74E-07
45	exh12	1.27	1	0.71	0.92	0.00033	1.0224E-06	1.41	1.30	--------->	1.65E-06
48	exh14	1.2	1.02	0.78	0.89	0.00031	1.1232E-08	1.31	1.14	--------->	1.81E-06
47	exh16	0.91	0.89	0.85	0.88	0.00023	1.224E-06	1.05	1.04	--------->	1.97E-08
48	exh18	1.19	0.9	0.71	0.82	0.00030	1.0224E-06	1.27	1.15	--------->	1.65E-06
49	exh20	1.26	1.08	0.82	0.98	0.00032	1.1808E-08	1.32	1.20	--------->	1.9E-06
50	exh22	1.12	0.91	0.78	0.9	0.00029	1.1232E-06	1.17	1.15	--------->	1.81E-06

	A	B	C	D	E	F	G	H	I	J	K
1	SMPS30F										
2											
3	stroke	b ticks	h1 ticks	ho ticks	h2 ticks	b (m)	ho (m)	gam1	gam2	oil thickness	ho (m)
4	int2	1.08	0.72	0.44	0.85	0.00027972	6.42E-07	1.64	1.48	correction	9.96E-07
5	int6	0.93	0.41	0.29	0.38	0.00024067	4.23E-07	1.41	1.31	factor applied	6.56E-07
6	int10	0.91	0.19	0.09	0.13	0.00023569	1.31E-07	2.11	1.44	--------->	2.04E-07
7	int12	1	0.38	0.15	0.32	0.000259	2.19E-07	2.53	2.13	--------->	3.39E-07
8	int14	1.06	0.45	0.32	0.44	0.00027972	4.67E-07	1.41	1.38	--------->	7.24E-07
9	int16	1	0.83	0.72	0.61	0.000259	1.05E-06	1.15	1.13	--------->	1.63E-06
10	int18	1	1	0.83	0.9	0.000259	1.21E-06	1.20	1.08	--------->	1.88E-06
11	int20	0.92	0.63	0.72	0.73	0.00023828	1.05E-06	1.15	1.01	--------->	1.63E-06
12	int22	1	0.56	0.35	0.45	0.000259	5.11E-07	1.60	1.29	--------->	7.92E-07
13											
14	comp1	0.95	1.82	1.22	1.28	0.00024605	1.78E-06	1.33	1.05	--------->	2.78E-06
15	comp3	1.23	1.68	1.39	1.5	0.00031857	2.03E-06	1.21	1.08	--------->	3.15E-06
16	comp5	1.18	1.67	1.43	1.52	0.00030562	2.09E-06	1.17	1.06	--------->	3.24E-06
17	comp7	1.12	1.31	1.12	1.19	0.00029008	1.64E-06	1.17	1.06	--------->	2.53E-06
18	comp9	1.05	1.49	1.32	1.35	0.00027195	1.93E-06	1.13	1.02	--------->	2.99E-06
19	comp11	1	1.76	1.61	1.69	0.000259	2.35E-06	1.09	1.05	--------->	3.64E-06
20	comp13	1.05	1.42	1.22	1.25	0.00027195	1.78E-06	1.16	1.02	--------->	2.76E-06
21	comp15	1.19	1.6	1.36	1.61	0.00030821	2.01E-06	1.16	1.17	--------->	3.12E-06
22	comp17	1.24	1.43	1.19	1.35	0.00032118	1.74E-06	1.20	1.13	--------->	2.89E-06
23	comp19	1.23	1.51	1.22	1.28	0.00031857	1.78E-06	1.24	1.05	--------->	2.76E-08
24	comp21	1.24	1.56	1.39	1.5	0.00032118	2.03E-06	1.12	1.08	--------->	3.15E-06
25											
26	pwr1	0.96	0.92	0.71	0.73	0.00025382	1.04E-06	1.30	1.03	--------->	1.61E-06
27	pwr3	0.99	0.81	0.72	0.79	0.00025641	1.05E-06	1.13	1.10	--------->	1.63E-06
28	pwr5	1.12	0.83	0.65	0.81	0.00029008	9.49E-07	1.28	1.25	--------->	1.47E-06
29	pwr7	0.89	0.88	0.78	0.86	0.00023051	1.14E-06	1.13	1.10	--------->	1.77E-06
30	pwr9	0.94	0.81	0.67	0.8	0.00024346	9.78E-07	1.21	1.19	--------->	1.52E-06
31	pwr11	0.98	0.81	0.66	0.69	0.00025382	9.93E-07	1.19	1.01	--------->	1.54E-06
32	pwr13	0.9	0.67	0.5	0.56	0.0002331	7.30E-07	1.34	1.12	--------->	1.13E-06
33	pwr15	0.79	0.73	0.6	0.62	0.00020461	8.76E-07	1.22	1.03	--------->	1.36E-06
34	pwr17	0.87	0.93	0.75	0.78	0.00022533	1.10E-06	1.24	1.04	--------->	1.70E-06
35	pwr19	0.96	0.73	0.58	0.68	0.00024864	8.47E-07	1.26	1.17	--------->	1.31E-06
36	pwr21	0.92	0.96	0.76	0.6	0.00023828	1.14E-06	1.23	1.03	--------->	1.77E-06
37											
38	exh2	1.28	1.02	0.83	0.98	0.00033152	1.21E-06	1.23	1.18	--------->	1.88E-06
39	exh6	0.79	0.79	0.55	0.59	0.00020461	8.03E-07	1.44	1.07	--------->	1.24E-06
40	exh8	1.2	0.29	0.12	0.28	0.0003108	1.75E-07	2.42	2.17	--------->	2.72E-07
41	exh10	1.27	0.46	0.28	0.36	0.00032893	4.09E-07	1.64	1.29	--------->	6.34E-07
42	exh12	0.93	0.17	0.08	0.16	0.00024087	1.17E-07	2.13	2.00	--------->	1.81E-07
43	exh14	1.08	0.6	0.46	0.53	0.00027972	6.72E-07	1.30	1.15	--------->	1.04E-06
44	exh16	1.26	0.61	0.42	0.59	0.00032634	6.13E-07	1.45	1.40	--------->	9.50E-07
45	exh18	1.2	0.89	0.59	0.72	0.0003108	8.61E-07	1.51	1.22	--------->	1.34E-06
46	exh20	1.3	0.91	0.51	0.72	0.0003387	7.45E-07	1.78	1.41	--------->	1.15E-06
47	exh22	0.88	0.6	0.35	0.39	0.00022792	5.11E-07	1.71	1.11	--------->	7.92E-07

	A	B	C	D	E	F	G	H	I	J	K
1	SBPM15F										
2											
3	stroke	x1	x2	x3	y1	y2	y3	b (m)	ho (m)	gam1	gam2
4	int6	-15.12	-14.93	-14.6	2.49	0.84	3.77	0.00052	0.00000064	2.96	4.49
5	int6	-15.34	-15.14	-14.64	3.47	0.37	2.52	0.0005	0.00000037	9.38	6.61
8	int10	-15.24	-15.02	-14.76	2.44	0.87	2.21	0.00046	0.00000087	2.60	2.54
7	int12	-15.26	-15.07	-14.76	3.16	1.25	2.91	0.00046	0.00000125	2.54	2.33
8	int14	-15.19	-14.99	-14.73	2.68	1.55	2.94	0.00046	0.00000155	1.86	1.90
9	int16	-15.26	-15.07	-14.78	3.91	2.17	3.63	0.00048	0.00000217	1.80	1.67
10	int16	-15.27	-15.07	-14.8	1.74	0.2	1.6	0.00047	0.0000002	6.70	6.00
11	int20	-15.3	-15.11	-14.83	3.15	2.11	3.34	0.00047	0.00000211	1.49	1.56
12											
13	comp1	14.92	15.22	15.4	3.94	1.85	2.64	0.00048	0.00000165	2.13	1.43
14	comp3	14.93	15.16	15.36	2.98	1.69	3.21	0.00043	0.00000189	1.58	1.70
15	comp5	15	15.33	15.51	5.72	2.82	3.84	0.00051	0.00000282	2.03	1.29
16	comp7	14.87	15.15	15.35	3.26	1.32	2.78	0.00048	0.00000132	2.47	2.11
17	comp9	14.94	15.22	15.42	3.89	1.98	3.38	0.00048	0.00000198	1.96	1.71
18	comp11	15.21	15.47	15.66	2.16	0.84	2.04	0.00045	0.00000084	2.80	2.43
19	comp13	15.31	15.58	15.78	3.89	1.91	3.07	0.00047	0.00000191	2.04	1.61
20	comp15	14.73	15.02	15.2	3.07	1.45	2.69	0.00047	0.00000145	2.12	1.66
21	comp17	14.84	15.16	15.33	4.6	1.61	2.45	0.00049	0.00000161	2.54	1.35
22	comp19	14.85	15.03	15.2	4.81	1.7	2.77	0.00055	0.0000017	2.83	1.63
23	comp21	15.22	15.52	15.73	3.9	1.46	3.87	0.00051	0.00000146	2.67	2.65
24											
25	pwr1	-15.39	-15.19	-14.92	5.58	2.59	4.3	0.00047	0.00000259	2.15	1.66
28	pwr3	-15.08	-14.84	-14.65	4.19	2.93	3.85	0.00041	0.00000293	1.43	1.31
27	pwr5	-15.32	-15.11	-14.85	4.3	2.53	4.04	0.00047	0.00000253	1.70	1.60
28	pwr7	-16.12	-15.91	-15.55	6.92	2.76	6.15	0.00057	0.00000276	2.51	2.23
29	pwr9	-16.15	-15.91	-15.5	8.56	2.81	7.77	0.00065	0.00000281	3.05	2.77
30	pwr11	-16.2	-16	-15.76	6.13	3.02	3.94	0.00044	0.00000302	2.03	1.30
31	pwr13	-16.07	-15.83	-15.5	6.4	2.38	5.53	0.00057	0.00000236	2.69	2.32
32	pwr15	-15.23	-15.03	-14.65	3.61	2.05	2.52	0.00038	0.00000205	1.76	1.23
33	pwr17	-16.08	-15.88	-15.49	6.32	2.91	6.56	0.00059	0.00000291	2.17	2.25
34	pwr19	-16.08	-15.86	-15.63	5.29	3.27	4.24	0.00045	0.00000327	1.62	1.30
35	pwr21	-16.05	-15.83	-15.55	4.83	2.79	4.09	0.0005	0.00000279	1.73	1.47
38											
37	exh2	14.64	15.16	15.33	2.69	0.61	1.56	0.00049	0.00000081	3.57	1.95
38	exh4	14.61	15.09	15.27	2.77	1.46	2.26	0.00048	0.00000146	1.90	1.55
39	exh6	15.31	15.63	15.82	4.44	1.66	2.53	0.00051	0.00000166	2.67	1.52
40	exh8	14.72	15.04	15.26	3.47	0.77	3.31	0.00054	0.00000077	4.51	4.30
41	exh10	14.72	15.01	15.21	3.01	0.86	2.34	0.00049	0.00000066	3.50	2.72
42	exh12	15.26	15.55	15.72	3.55	1.33	1.52	0.00046	0.00000133	2.67	1.14
43	exh14	15.18	15.46	15.87	2.34	0.74	2.43	0.00049	0.00000074	3.18	3.28
44	exh16	14.9	15.19	15.4	3.54	1.36	2.35	0.0005	0.00000136	2.80	1.73
45	exh20	15.08	15.36	15.54	2.92	1.25	2.69	0.00046	0.00000125	2.34	2.15
48	exh22	15.14	15.41	15.8	2.97	1.46	2.17	0.00046	0.00000146	2.03	1.49

	A	B	C	D	E	F	G	H	I	J	K
1	SBPM30F										
2											
3	stroke	x1	x2	x3	y1	y2	y3	b (m)	ho (m)	gam1	gam2
4	int2	-15.33	-15.12	-14.67	2.8	1.34	3.27	0.00046	0.00000134	2.09	2.44
5	int4	-15.28	-15.08	-14.8	3.18	0.99	2.9	0.00048	0.00000099	3.21	2.93
6	int6	-15.11	-14.93	-14.59	2.44	0.78	3.75	0.00052	0.00000078	3.13	4.81
7	int8	-15.35	-15.14	-14.86	3.53	0.33	2.54	0.00049	0.00000033	10.70	7.70
8	int10	-15.21	-15.03	-14.77	2.39	0.98	2.19	0.00044	0.00000096	2.49	2.28
9	int12	-15.25	-15.06	-14.79	3.11	1.26	2.66	0.00046	0.00000126	2.47	2.27
10	int14	-15.19	-14.97	-14.72	2.61	1.36	2.63	0.00047	0.00000136	2.07	1.93
11	int16	-15.24	-15.03	-14.77	3.76	2.27	3.63	0.00047	0.00000227	1.66	1.69
12	int18	-15.27	-15.07	-14.79	1.71	0.3	1.6	0.00046	0.0000003	5.70	5.33
13	int22	-15.19	-14.99	-14.73	3.06	1.64	3.07	0.00046	0.00000164	1.66	1.67
14											
15	comp1	14.92	15.24	15.4	3.88	1.72	2.45	0.00048	0.00000172	2.26	1.42
16	comp3	14.9	15.15	15.31	2.77	1.78	2.3	0.00041	0.00000178	1.56	1.29
17	comp5	14.99	15.3	15.47	5.64	3.01	3.85	0.00048	0.00000301	1.87	1.28
18	comp7	14.73	14.99	15.18	3.08	1.39	1.92	0.00045	0.00000139	2.22	1.38
19	comp9	14.94	15.25	15.42	3.93	2.03	3.31	0.00048	0.00000203	1.94	1.63
20	comp11	15.23	15.5	15.68	2.28	0.8	1.61	0.00045	0.0000008	2.85	2.01
21	comp13	14.75	15.03	15.2	2.2	1.13	2.04	0.00045	0.00000113	1.95	1.81
22	comp15	14.73	15.01	15.19	3.07	1.38	2.58	0.00046	0.00000136	2.22	1.87
23	comp17	14.84	15.17	15.33	4.55	1.95	2.38	0.00049	0.00000195	2.33	1.22
24	comp19	14.65	14.99	15.18	4.64	1.74	2.68	0.00053	0.00000174	2.67	1.54
25	comp21	15.22	15.54	15.73	3.86	1.34	3.75	0.00051	0.00000134	2.88	2.80
26											
27	pwr1	-15.39	-15.2	-14.92	5.23	2.42	4.02	0.00047	0.00000242	2.16	1.66
28	pwr3	-15.11	-14.91	-14.7	4.44	2.73	3.7	0.00041	0.00000273	1.63	1.36
29	pwr5	-15.35	-15.13	-14.64	5.06	2.39	4.03	0.00051	0.00000239	2.12	1.69
30	pwr7	-16.12	-15.9	-15.56	6.7	2.38	5.91	0.00056	0.00000238	2.82	2.48
31	pwr9	-15.25	-15.06	-14.81	3.58	1.93	3.04	0.00044	0.00000193	1.85	1.58
32	pwr11	-16.13	-15.93	-15.64	5.75	2.88	5	0.00049	0.00000288	2.00	1.74
33	pwr13	-16.11	-15.87	-15.55	8.69	2.2	5.03	0.00056	0.0000022	3.95	2.29
34	pwr15	-14.92	-14.71	-14.55	3.34	1.54	2.22	0.00037	0.00000154	2.17	1.44
35	pwr17	-16.1	-15.91	-15.5	6.84	2.72	6.56	0.0008	0.00000272	2.51	2.41
36	pwr19	-16.11	-15.91	-15.65	5.98	3.31	4.44	0.00046	0.00000331	1.81	1.34
37	pwr21	-15.77	-15.61	-15.34	4.44	2.74	3.64	0.00043	0.00000274	1.62	1.33
38											
39	exh2	14.83	15.14	15.3	3.01	0.82	1.01	0.00047	0.00000082	3.67	1.23
40	exh4	14.8	15.1	15.26	2.65	1.29	2.2	0.00046	0.00000129	2.05	1.71
41	exh6	15.31	15.63	15.82	4.17	1.56	2.44	0.00051	0.00000156	2.67	1.56
42	exh8	14.74	15.03	15.25	3.23	0.54	3.16	0.00051	0.00000054	5.96	5.65
43	exh10	14.73	15.02	15.21	2.86	0.68	2.08	0.00048	0.00000066	4.21	3.06
44	exh12	14.69	14.96	15.15	2.17	1.17	1.6	0.00046	0.00000117	1.85	1.37
45	exh14	15.15	15.44	15.63	2.52	0.58	1.79	0.00048	0.00000058	4.34	3.09
46	exh16	14.89	15.19	15.36	3.43	1.52	2.04	0.00047	0.00000152	2.26	1.34
47	exh20	15.07	15.34	15.54	2.85	1.28	2.98	0.00047	0.00000128	2.23	2.33
48	exh22	15.21	15.49	15.71	3.47	1.51	1.88	0.0005	0.00000151	2.30	1.25

	A	B	C	D	E	F	Q	H	I	J	K
1	SBPS15F										
2											
3	stroke	x1	x2	x3	y1	y2	y3	b (m)	ho (m)	gam1	gam2
4	int1	-15.12	-14.93	-14.65	3.24	1.73	3.16	0.00047	0.00000173	1.67	1.63
5	int3	-15.22	-15.03	-14.74	3.18	1.68	2.83	0.00046	0.00000168	1.89	1.66
6	int5	-15.2	-15	-14.69	2.92	1.73	4.06	0.00051	0.00000173	1.69	2.36
7	int7	-15.07	-14.89	-14.67	3.41	2.22	3.32	0.0004	0.00000222	1.54	1.50
8	int9	-15.09	-14.9	-14.66	2.84	1.54	2.67	0.00043	0.00000154	1.84	1.73
9	int11	-15.27	-15.07	-14.66	3.54	2.45	3.39	0.00041	0.00000245	1.44	1.36
10	int13	-15.15	-14.94	-14.65	3.03	1.65	3.9	0.0005	0.00000165	1.64	2.11
11	int15	-15.07	-14.66	-14.62	3.69	2.22	3.16	0.00045	0.00000222	1.75	1.42
12	int17	-15.29	-15.09	-14.91	3.63	2.01	2.48	0.00036	0.00000201	1.81	1.23
13	int19	-15.2	-15	-14.78	3.61	2.08	3.2	0.00042	0.00000208	1.74	1.54
14											
15	comp2	15.16	15.53	15.71	5.98	2.69	4.69	0.00055	0.00000269	2.22	1.74
16	comp4	15.06	15.43	15.61	5.32	1.96	4.16	0.00053	0.00000198	2.69	2.10
17	comp6	14.97	15.32	15.51	6.25	2.62	4.72	0.00054	0.00000262	2.22	1.67
18	comp8	14.87	15.33	15.51	7.33	1.73	4.37	0.00064	0.00000173	4.24	2.53
19	comp10	14.9	15.3	15.46	7.29	3.12	4.09	0.00056	0.00000312	2.34	1.31
20	comp12	15.15	15.51	15.69	5.67	2.8	3.99	0.00054	0.0000026	2.03	1.43
21	comp14	14.94	15.39	15.55	6.55	2.01	3.42	0.00061	0.00000201	3.26	1.70
22	comp16	15.3	15.71	15.9	6.66	2.37	3.48	0.0006	0.00000237	2.81	1.47
23	comp18	15.04	15.37	15.58	8.37	3.06	5.5	0.00054	0.00000306	2.08	1.60
24	comp20	15.2	15.53	15.74	4.36	1.52	3.53	0.00054	0.00000152	2.67	2.32
25											
26	pwr2	-14.86	-14.66	-14.45	3.3	2.15	3.21	0.00043	0.00000215	1.53	1.49
27	pwr4	-14.79	-14.62	-14.47	2.07	1.4	1.7	0.00032	0.0000014	1.46	1.21
28	pwr6	-14.92	-14.71	-14.54	3.51	1.78	2.47	0.00038	0.00000178	1.97	1.39
29	pwr6	-14.96	-14.76	-14.63	2.05	1.34	1.71	0.00033	0.00000134	1.53	1.26
30	pwr10	-14.93	-14.73	-14.55	2.64	1.54	2.37	0.00038	0.00000154	1.71	1.54
31	pwr12	-14.81	-14.6	-14.34	3.94	1.76	3.62	0.00047	0.00000176	2.24	2.06
32	pwr14	-15.15	-14.93	-14.7	3.9	1.94	3.24	0.00045	0.00000194	2.01	1.67
33	pwr16	-15.05	-14.86	-14.59	2.93	1.36	2.5	0.00046	0.00000136	2.15	1.64
34	pwr16	-15.06	-14.83	-14.56	2.53	0.92	2.46	0.0005	0.00000092	2.75	2.67
35	pwr20	-15.13	-14.94	-14.78	3.15	2.36	2.77	0.00035	0.00000236	1.33	1.17
36											
37	exh1	15.41	15.78	15.95	4.24	1.44	2.36	0.00054	0.00000144	2.94	1.64
38	exh3	14.97	15.3	15.48	5	1.99	3.95	0.00051	0.00000199	2.51	1.98
39	exh5	15.16	15.49	15.67	4.57	1.85	3.05	0.00051	0.00000185	2.47	1.65
40	exh7	15.63	15.9	16.08	3.47	1.28	2.6	0.00045	0.00000128	2.71	2.03
41	exh11	14.94	15.44	15.6	8.63	2.73	5.2	0.00066	0.00000273	3.16	1.90
42	exh13	15.16	15.46	15.65	4.19	2.55	3.76	0.00047	0.00000255	1.64	1.47
43	exh15	15.46	15.72	15.91	3.73	1.99	2.45	0.00045	0.00000199	1.87	1.23
44	exh17	14.94	15.35	15.54	6.09	2.1	4.39	0.0006	0.0000021	2.90	2.09
45	exh19	14.97	15.38	15.53	6.61	2.66	3.49	0.00056	0.00000266	2.48	1.31

	A	B	C	D	E	F	G	H	I	J	K
1	SBPS30F										
2											
3	stroke	x1	x2	x3	y1	y2	y3	b (m)	ho (m)	gam1	gam2
4	int1	-15.34	-15.14	-14.95	2.14	1.88	1.75	0.00039	0.00000188	1.14	0.93
5	int5	-15.33	-15.14	-14.9	0.72	0.52	1.35	0.00043	0.00000052	1.38	2.60
6	int7	-15.29	-15.14	-14.96	0.36	0.12	0.63	0.00033	0.00000012	3.00	5.25
7	int9	-15.16	-14.96	-14.82	0.57	0.22	0.61	0.00034	0.00000022	2.59	2.77
8	int11	-15.4	-15.16	-15.01	0.85	0.17	0.93	0.00039	0.00000017	5.00	5.47
9	int15	-15.1	-14.92	-14.67	2.14	1.63	2.66	0.00043	0.00000163	1.31	1.77
10											
11	comp2	15.94	16.21	16.36	3.26	1.64	1.88	0.00044	0.00000184	1.77	1.02
12	comp4	16	16.21	16.37	3.14	2.33	2.55	0.00037	0.00000233	1.35	1.09
13	comp6	15.89	16.07	16.21	1.96	1.51	1.59	0.00032	0.00000151	1.30	1.05
14	comp8	15.82	16.11	16.26	3.9	1.73	2.06	0.00046	0.00000173	2.25	1.20
15	comp10	15.69	16.09	16.26	2.61	1.7	1.92	0.00037	0.0000017	1.54	1.13
16	comp12	15.83	15.96	16.17	2.43	2	2.44	0.00034	0.000002	1.22	1.22
17	comp14	15.89	16.14	16.28	3.54	2.52	2.52	0.00039	0.00000252	1.40	1.00
18	comp16	15.83	16.06	16.2	3.27	2.13	2.39	0.00037	0.00000213	1.54	1.12
19	comp18	16.05	16.3	16.46	3.37	2.26	2.6	0.00043	0.00000226	1.49	1.15
20	comp20	16.06	16.32	16.49	2.88	2	2.26	0.00043	0.000002	1.44	1.13
21											
22	pwr2	-14.97	-14.77	-14.5	1.3	0.74	2.65	0.00047	0.00000074	1.76	3.65
23	pwr4	-15.11	-14.93	-14.77	1.28	1.16	1.45	0.00034	0.00000116	1.10	1.25
24	pwr6	-15.01	-14.64	-14.67	2.2	1.28	1.86	0.00034	0.00000126	1.72	1.45
25	pwr8	-14.9	-14.72	-14.57	1.61	1.23	1.56	0.00033	0.00000123	1.31	1.27
26	pwr10	-14.95	-14.79	-14.6	2.18	1.66	2.24	0.00035	0.00000166	1.31	1.35
27	pwr12	-14.94	-14.78	-14.71	1.62	1.13	1.18	0.00023	0.00000113	1.43	1.04
28	pwr14	-14.91	-14.75	-14.47	1.48	0.93	2.45	0.00044	0.00000093	1.59	2.63
29	pwr16	-14.89	-14.74	-14.57	1.68	1.51	2.03	0.00032	0.00000151	1.11	1.34
30	pwr18	-14.72	-14.55	-14.37	1.6	1.31	1.49	0.00035	0.00000131	1.37	1.14
31	pwr20	-14.94	-14.8	-14.63	1.11	0.96	1.34	0.00031	0.00000096	1.16	1.40
32											
33	exh1	15.22	15.6	15.79	5.48	1.52	2.26	0.00057	0.00000152	3.61	1.49
34	exh3	15.66	15.93	16.1	1.88	0.85	1.1	0.00044	0.00000085	2.21	1.29
35	exh5	15.44	15.72	15.9	1.81	0.47	1.43	0.00046	0.00000047	3.85	3.04
36	exh7	15.5	15.79	15.93	1.46	0.25	0.25	0.00043	0.00000025	5.92	1.00
37	exh9	15.47	15.77	15.94	1.36	0.19	0.42	0.00047	0.00000019	7.16	2.21
38	exh11	15.7	15.96	16.15	1.33	0.17	0.36	0.00045	0.00000017	7.82	2.24
39	exh15	15.32	15.7	15.87	5.05	1.29	1.67	0.00055	0.00000129	3.91	1.29

	A	B	C	D	E	F	G	H	I
1	SMPM15.X								
2									
3	stroke	b ticks	h1 ticks	ho ticks	h2 ticks	b (m)	ho (m)	gam1	gam2
4	int1	1.4	1.87	1.1	1.65	0.0003626	1.61E-06	1.70	1.50
5	int3	1	2.22	2.03	2.08	0.000259	2.96E-06	1.09	1.02
6	int5	0.81	2.07	1.79	1.9	0.00020979	2.61E-06	1.16	1.06
7	int7	1.4	3.12	2.37	2.73	0.0003626	3.46E-06	1.32	1.15
8	int9	1.22	2.08	1.69	1.89	0.00031598	2.47E-06	1.23	1.12
9	int11	1.32	2.7	2.17	2.49	0.00034188	3.17E-06	1.24	1.15
10	int13	1.28	2.91	2.47	2.68	0.00033152	3.61E-06	1.18	1.09
11	int15	1.18	2.18	1.83	2.06	0.00030562	2.67E-06	1.19	1.13
12	int17	1.26	2.37	1.98	2.28	0.00032634	2.89E-06	1.20	1.15
13	int19	1.26	2.05	1.48	1.85	0.00032634	2.16E-06	1.39	1.25
14	int21	0.8	2.12	1.9	1.98	0.0002072	2.77E-06	1.12	1.04
15									
16	comp4	0.9	1.28	1.05	1.18	0.0002331	1.53E-06	1.22	1.12
17	comp6	1.48	2.02	1.42	1.74	0.00038332	2.07E-06	1.42	1.23
18	comp8	1.23	1.42	1.02	1.25	0.00031857	1.49E-06	1.39	1.23
19	comp10	1.68	2.09	1.29	1.57	0.00043512	1.88E-06	1.62	1.22
20	comp12	1.67	2.03	1.28	1.58	0.00043253	1.87E-06	1.59	1.23
21	comp14	1.59	2.08	1.31	1.58	0.00041181	1.91E-06	1.59	1.21
22	comp16	1.69	1.82	0.9	1.18	0.00043771	1.31E-06	2.02	1.31
23	comp18	1.29	1.66	1.31	1.54	0.00033411	1.91E-06	1.27	1.18
24	comp20	1.7	2.22	1.22	1.58	0.0004403	1.78E-06	1.82	1.30
25	comp22	1.72	2.14	1.18	1.55	0.00044548	1.72E-06	1.81	1.31
26									
27	exp2	1.38	1.96	1.49	1.83	0.00035742	2.18E-06	1.32	1.23
28	exp4	1.18	1.85	1.42	1.76	0.00030562	2.07E-06	1.30	1.24
29	exp6	1.32	2.07	1.53	1.92	0.00034188	2.23E-06	1.35	1.25
30	exp8	1.29	1.83	1.35	1.69	0.00033411	1.97E-06	1.36	1.25
31	exp10	1.67	2.42	1.53	2.28	0.00043253	2.23E-06	1.58	1.49
32	exp12	1.32	2.05	1.47	1.84	0.00034188	2.15E-06	1.39	1.25
33	exp14	1.78	2.43	1.62	2.15	0.00046102	2.37E-06	1.50	1.33
34	exp16	1.22	2.48	2.03	2.28	0.00031598	2.96E-06	1.22	1.12
35	exp18	1.35	2.34	1.88	2.18	0.00034965	2.74E-06	1.24	1.16
36	exp20	1.39	2.33	1.74	2.19	0.00036001	2.54E-06	1.34	1.26
37	exp22	1.38	2.25	1.5	2	0.00035742	2.19E-06	1.50	1.33
38									
39	exh1	1.68	2.46	1.63	1.98	0.00043008	2.36E-06	1.51	1.21
40	exh3	1.38	1.77	1.32	1.7	0.00035328	1.91E-06	1.34	1.29
41	exh5	1.68	2.17	1.48	1.73	0.00043008	2.15E-06	1.47	1.17
42	exh7	1.76	2.6	1.63	1.8	0.00045056	2.36E-06	1.60	1.10
43	exh9	1.25	1.79	1.52	1.65	0.00032	2.20E-06	1.18	1.09
44	exh11	1.18	1.7	1.4	1.56	0.00030208	2.03E-06	1.21	1.11
45	exh13	1.71	2.4	1.58	1.89	0.00043776	2.29E-06	1.52	1.20
46	exh17	1.39	2.35	1.88	1.97	0.00035584	2.73E-06	1.25	1.05
47	exh19	1.59	2	1.2	1.54	0.00040704	1.74E-06	1.67	1.28
48	exh21	1.6	2.24	1.42	1.73	0.0004096	2.06E-06	1.58	1.22

	A	B	C	D	E	F	G	H	I
1	SMPM30.X								
2									
3	stroke	b ticks	h1 ticks	ho ticks	h2 ticks	b (m)	ho (m)	gam1	gam2
4	int2	1.21	1.52	1.38	1.5	0.00031339	2.01E-06	1.10	1.09
5	int4	1.2	1.31	1.13	1.27	0.0003108	1.65E-06	1.16	1.12
6	int6	0.96	1.25	1.03	1.1	0.00024864	1.50E-06	1.21	1.07
7	int8	0.96	1.42	1.25	1.31	0.00024864	1.63E-06	1.14	1.05
8	int10	1	1.58	1.32	1.41	0.000259	1.93E-06	1.20	1.07
9	int12	0.94	1.51	1.3	1.38	0.00024346	1.90E-06	1.18	1.06
10	int14	0.72	1.85	1.58	1.72	0.00018648	2.31E-06	1.17	1.09
11	int16	0.63	1.57	1.36	1.49	0.00021497	2.01E-06	1.14	1.08
12	int18	1.04	1.47	1.26	1.29	0.00026936	1.84E-06	1.17	1.02
13	int20	0.88	1.5	1.29	1.47	0.00022792	1.86E-06	1.16	1.14
14	int22	1.06	1.49	1.2	1.38	0.00027454	1.75E-06	1.24	1.15
15									
16	comp1	1.24	1.57	0.97	1.08	0.00032116	1.42E-06	1.62	1.11
17	comp3	1.18	1.21	0.99	1.12	0.00030562	1.45E-06	1.22	1.13
18	comp5	1.3	1.56	1.18	1.37	0.0003387	1.72E-06	1.32	1.16
19	comp7	1.25	1.18	0.98	1.1	0.00032375	1.43E-06	1.20	1.12
20	comp9	1.2	1.14	1.08	1.1	0.0003108	1.58E-06	1.06	1.02
21	comp11	1.21	1.67	1.22	1.36	0.00031339	1.78E-06	1.37	1.11
22	comp13	1.4	1.79	1.2	1.54	0.0003626	1.75E-06	1.49	1.26
23	comp15	1.17	1.35	1.07	1.22	0.00030303	1.58E-06	1.26	1.14
24	comp17	1.21	1.69	1.48	1.57	0.00031339	2.16E-06	1.14	1.06
25	comp19	1.16	1.41	1.21	1.33	0.00030044	1.77E-06	1.17	1.10
26	comp21	1.36	1.21	0.78	1.03	0.00035224	1.14E-06	1.55	1.32
27									
28	exp1	1.11	1.3	0.92	1.03	0.00026749	1.34E-06	1.41	1.12
29	exp3	0.81	1.14	1.02	1.08	0.00020979	1.49E-06	1.12	1.06
30	exp5	0.8	1.05	0.96	1.01	0.0002072	1.40E-06	1.09	1.05
31	exp7	0.75	1.09	0.88	1.05	0.00019425	1.28E-06	1.24	1.19
32	exp9	0.85	1.26	1.02	1.16	0.00022015	1.49E-06	1.24	1.14
33	exp11	0.96	1.08	0.92	1.05	0.00024864	1.34E-06	1.17	1.14
34	exp13	0.98	1.07	0.93	1.05	0.00025382	1.38E-06	1.15	1.13
35	exp15	0.98	0.88	0.72	0.83	0.00025382	1.05E-06	1.22	1.15
36	exp17	0.98	1.28	1.11	1.17	0.00025382	1.62E-06	1.15	1.05
37	exp19	0.78	0.97	0.87	0.89	0.00020202	1.27E-06	1.11	1.02
38	exp21	0.8	1.02	0.83	0.9	0.0002072	1.21E-06	1.23	1.08
39									
40	exh2	1.23	1.33	1.16	1.22	0.00031488	1.68E-06	1.15	1.05
41	exh4	1.23	1.42	1.18	1.33	0.00031488	1.71E-06	1.20	1.13
42	exh6	1.36	1.26	1.12	1.24	0.00034816	1.62E-06	1.13	1.11
43	exh8	1.08	1.21	0.99	1.2	0.00027648	1.44E-06	1.22	1.21
44	exh10	1.22	0.86	0.73	0.79	0.00031232	1.06E-06	1.16	1.08
45	exh12	1.2	1.32	0.9	1.11	0.0003072	1.31E-06	1.47	1.23
46	exh14	1.3	1.41	1.24	1.33	0.0003326	1.60E-06	1.14	1.07
47	exh16	1.32	1.53	1.37	1.51	0.00033792	1.99E-06	1.12	1.10
48	exh18	1.18	1.45	1.22	1.31	0.00030208	1.77E-06	1.19	1.07
49	exh20	1.1	1.38	1.1	1.3	0.0002816	1.60E-06	1.25	1.18
50	exh22	1.08	1.2	0.89	1	0.00027648	1.29E-06	1.35	1.12

	A	B	C	D	E	F	G	H	I
1	SMPS15.X								
2									
3	stroke	b ticks	h1 ticks	ho ticks	h2 ticks	b (m)	ho (m)	gam1	gam2
4	int2	0.9	3.21	3.06	3.1	0.0002331	4.50E-06	1.04	1.01
5	int4	1.05	3	2.6	2.79	0.00027195	3.60E-06	1.15	1.07
8	int6	1.26	3.97	3.61	3.66	0.00033152	5.27E-06	1.10	1.07
7	int8	1.03	3.57	3.4	3.47	0.00026677	4.96E-06	1.05	1.02
8	int10	0.93	3.92	3.89	3.82	0.00024087	5.39E-08	1.06	1.04
9	int12	1	3.33	3.03	3.09	0.000259	4.42E-06	1.10	1.02
10	int14	0.96	4.03	3.67	3.79	0.00024864	5.36E-06	1.10	1.03
11	int16	1.06	3.33	3.06	3.21	0.00027454	4.50E-06	1.06	1.04
12	int16	1.23	3.22	2.94	3.11	0.00031857	4.29E-06	1.10	1.06
13	int20	1.02	3.35	3.03	3.18	0.00026418	4.42E-06	1.11	1.05
14	int22	0.98	3.71	3.11	3.24	0.00025382	4.54E-08	1.19	1.04
15									
16	comp1	1.71	2.49	1.76	1.97	0.00044289	2.57E-06	1.41	1.12
17	comp3	1.68	2.71	1.97	2.1	0.00043512	2.68E-06	1.38	1.07
18	comp5	1.76	3.63	2.55	3.42	0.00046102	3.72E-06	1.50	1.34
19	comp7	1.37	3.32	2.73	2.96	0.00035483	3.99E-06	1.22	1.08
20	comp9	1.16	2.4	2.17	2.32	0.00030044	3.17E-06	1.11	1.07
21	comp11	1.4	2.52	2	2.21	0.0003626	2.92E-06	1.26	1.11
22	comp13	1.66	2.72	2.02	2.33	0.00042994	2.95E-06	1.35	1.15
23	comp17	1.73	2.79	1.7	2.04	0.00044807	2.48E-06	1.64	1.20
24	comp19	1.53	2.52	1.87	2.09	0.00039627	2.73E-06	1.35	1.12
25	comp21	1.78	3.81	2.98	3.29	0.00045584	4.35E-08	1.28	1.10
26									
27	exp1	1.51	1.97	1.29	1.68	0.00039109	1.86E-06	1.53	1.30
28	exp3	1.28	2.37	1.95	2.18	0.00033152	2.85E-06	1.22	1.12
29	exp5	0.96	2.16	1.85	1.97	0.00025382	2.70E-06	1.17	1.06
30	exp7	0.99	2.16	1.69	1.74	0.00025641	2.47E-06	1.28	1.03
31	exp9	0.92	1.78	1.52	1.83	0.00023828	2.22E-06	1.17	1.07
32	exp11	1.07	1.97	1.8	1.9	0.00027713	2.63E-06	1.09	1.06
33	exp13	1.02	1.96	1.61	1.7	0.00026418	2.35E-06	1.22	1.06
34	exp15	0.63	2.25	1.99	2.02	0.00021497	2.91E-06	1.13	1.02
35	exp17	1.76	1.69	1.57	1.75	0.00046102	2.29E-06	1.20	1.11
36	exp19	1.01	1.78	1.5	1.62	0.00026159	2.19E-06	1.19	1.08
37	exp21	1.17	1.88	1.59	1.62	0.00030303	2.32E-06	1.18	1.14
38									
39	exh2	1.29	2.19	1.9	2.1	0.00033024	2.76E-06	1.15	1.11
40	exh4	1.22	2.57	2.25	2.47	0.00031232	3.26E-06	1.14	1.10
41	exh8	1.58	2.82	2.15	2.37	0.00040448	3.12E-08	1.31	1.10
42	exh8	1.15	2.32	2.02	2.17	0.0002944	2.93E-06	1.15	1.07
43	exh10	1.06	2.2	1.98	2.12	0.00027136	2.87E-06	1.11	1.07
44	exh12	1.59	2.67	1.81	2.06	0.00040704	2.62E-06	1.46	1.14
45	exh14	1.3	2.5	2.18	2.4	0.0003328	3.16E-08	1.15	1.10
48	exh16	1.27	2.2	1.89	2.1	0.00032512	2.74E-06	1.16	1.11
47	exh18	1.59	2.72	2.02	2.48	0.00040704	2.93E-06	1.35	1.23
48	exh20	1.1	2.22	2.03	2.07	0.0002816	2.94E-06	1.09	1.02
49	exh22	1.28	2.71	2.22	2.5	0.00032768	3.22E-06	1.22	1.13

	A	B	C	D	E	F	G	H	I
1	SMPS30.X								
2									
3	stroke	b ticks	h1 ticks	ho ticks	h2 ticks	b (m)	ho (m)	gam1	gam2
4	int2	0.78	1.7	1.5	1.57	0.00020202	2.19E-06	1.13	1.05
5	int4	0.9	1.93	1.74	1.63	0.0002331	2.54E-06	1.11	1.05
6	int6	0.98	1.72	1.46	1.56	0.00025382	2.16E-06	1.16	1.05
7	int8	0.89	1.69	1.52	1.64	0.00023051	2.22E-06	1.11	1.06
8	int10	0.87	1.95	1.66	1.92	0.00022533	2.72E-06	1.05	1.03
9	int12	0.99	1.78	1.51	1.6	0.00025641	2.20E-06	1.18	1.06
10	int14	0.96	1.66	1.67	1.79	0.00024864	2.44E-06	1.11	1.07
11	int16	0.96	2.33	2.16	2.2	0.00024864	3.15E-06	1.06	1.02
12	int18	0.96	1.69	1.52	1.61	0.00024864	2.22E-06	1.11	1.06
13	int20	0.98	1.52	1.41	1.46	0.00025382	2.06E-06	1.08	1.04
14	int22	1.04	1.82	1.67	1.71	0.00028936	2.44E-06	1.09	1.02
15									
16	comp1	1.22	1.23	0.86	1.06	0.00031598	1.26E-06	1.43	1.23
17	comp3	1.06	1	0.85	0.67	0.00027454	1.24E-06	1.16	1.02
18	comp5	1.13	1.15	0.93	1.08	0.00029267	1.36E-06	1.24	1.16
19	comp7	1.31	1.43	1.17	1.35	0.00033929	1.71E-06	1.22	1.15
20	comp9	1.29	1.1	0.82	1.02	0.00033411	1.20E-06	1.34	1.24
21	comp11	1.07	1.29	1.06	1.17	0.00027713	1.55E-06	1.22	1.10
22	comp13	1.08	1.27	1.01	1.17	0.00027972	1.47E-06	1.26	1.16
23	comp15	1.23	1.34	0.95	1.06	0.00031857	1.39E-06	1.41	1.12
24	comp17	1.21	1.48	1.16	1.28	0.00031339	1.69E-06	1.28	1.10
25	comp19	1.23	1.48	1.26	1.42	0.00031857	1.84E-06	1.17	1.13
26	comp21	1.25	1.29	1.03	1.2	0.00032375	1.50E-06	1.25	1.17
27									
28	exp1	0.96	1.24	1.06	1.19	0.00024864	1.55E-06	1.17	1.12
29	exp3	0.86	1.42	1.29	1.35	0.00022274	1.86E-06	1.10	1.05
30	exp5	0.9	1.67	1.46	1.49	0.0002331	2.16E-06	1.13	1.01
31	exp7	0.81	1.35	1.12	1.13	0.00020979	1.64E-06	1.21	1.01
32	exp9	0.95	1.65	1.39	1.53	0.00024605	2.03E-06	1.19	1.10
33	exp11	0.91	1.37	1.3	1.35	0.00023569	1.90E-06	1.05	1.04
34	exp13	0.9	1.78	1.58	1.68	0.0002331	2.31E-06	1.13	1.06
35	exp15	0.87	1.29	1.12	1.17	0.00022533	1.64E-06	1.15	1.04
36	exp17	0.91	1.48	1.4	1.42	0.00023569	2.04E-06	1.06	1.01
37	exp19	0.89	1.61	1.42	1.47	0.00023051	2.07E-06	1.13	1.04
38	exp21	0.91	1.31	1.2	1.22	0.00023569	1.75E-06	1.09	1.02
39									
40	exh2	1.23	1	0.62	0.86	0.00031866	6.99E-07	1.61	1.42
41	exh4	1.4	1.26	0.6	1.15	0.0003564	1.16E-06	1.60	1.44
42	exh6	1.29	1.09	0.95	1.02	0.00033024	1.38E-06	1.15	1.07
43	exh8	1.05	1.28	1.09	1.11	0.0002688	1.58E-06	1.17	1.02
44	exh10	1.28	1.28	1.14	1.26	0.00032768	1.85E-06	1.12	1.11
45	exh12	1.32	1.21	0.92	1.07	0.00033792	1.33E-06	1.32	1.16
46	exh14	1.31	1.38	0.81	1.03	0.00033536	1.17E-06	1.70	1.27
47	exh16	0.82	1.08	0.97	1.02	0.00020992	1.41E-06	1.11	1.05
48	exh18	1.19	1.41	1.16	1.27	0.00030464	1.68E-06	1.22	1.09
49	exh20	1.27	1.34	1.03	1.17	0.00032512	1.49E-06	1.30	1.14
50	exh22	1.21	1.27	0.99	1.16	0.00030976	1.44E-06	1.28	1.17

	A	B	C	D	E	F	G	H	I	J	K
1	SBPM15.X										
2											
3	stroke	b ticks	h1 ticks	ho ticks	h2 ticks	b (m)	ho (m)	gam1	gam2		
4	int1	1.95	6.34	3.71	5.22	5.05E-04	5.36E-06	1.71	1.41		
5	int3	1.6	5.71	4.69	5.26	4.14E-04	6.60E-06	1.22	1.13		
6	int5	1.85	7.61	5.01	6.11	4.79E-04	7.26E-06	1.52	1.22		
7	int7	1.84	5.59	3.51	4.49	4.77E-04	5.09E-06	1.59	1.26		
8	int9	1.94	7.09	4.15	5.13	5.02E-04	6.02E-06	1.71	1.24		
9	int11	1.62	6.6	4.43	5.94	4.71E-04	6.42E-06	1.49	1.34		
10	int13	2.08	6.38	4.12	6.24	5.39E-04	5.97E-06	1.55	1.51		
11	int15	2.39	7.43	3.97	6.92	6.19E-04	5.76E-06	1.67	1.74		
12	int17	1.99	6.06	3.61	5.09	5.15E-04	5.23E-06	1.66	1.41		
13	int19	1.58	5.52	4.19	4.89	4.09E-04	6.06E-06	1.32	1.17		
14	int21	1.7	6.53	4.06	4.72	4.40E-04	5.89E-06	1.61	1.16		
15											
16	comp2	1.96	5.56	3.1	4.06	5.13E-04	4.50E-06	1.79	1.32		
17	comp4	1.68	5.28	3.8	4.28	4.35E-04	5.51E-06	1.39	1.13		
18	comp6	1.72	4.51	3.45	3.72	4.45E-04	5.00E-06	1.31	1.08		
19	comp8	1.71	4.93	3.73	4.4	4.43E-04	5.41E-06	1.32	1.18		
20	comp10	1.86	5.22	4.32	4.84	4.87E-04	6.26E-06	1.21	1.12		
21	comp12	1.81	4.8	3.5	4.05	4.69E-04	5.08E-06	1.37	1.16		
22	comp14	1.98	5.6	3.6	4.08	5.13E-04	5.22E-06	1.56	1.13		
23	comp16	1.66	4.69	3.33	3.8	4.62E-04	4.83E-06	1.41	1.14		
24	comp16	1.86	5.4	3.42	3.9	4.82E-04	4.96E-06	1.58	1.14		
25	comp20	2.18	5.63	3.19	5.18	5.65E-04	4.63E-06	1.76	1.62		
26	comp22	2.07	5.85	3.56	4.92	5.36E-04	5.16E-06	1.64	1.38		
27											
28	exp2	1.66	5.46	4.01	5.15	4.62E-04	5.61E-06	1.37	1.26		
29	exp6	1.76	5.29	3.8	4.79	4.56E-04	5.51E-06	1.39	1.26		
30	exp6	1.46	4.34	3.31	3.61	3.78E-04	4.60E-06	1.31	1.15		
31	exp10	1.32	4.3	3.77	4.25	3.42E-04	5.47E-06	1.14	1.13		
32	exp12	1.84	4.56	3.02	3.87	4.77E-04	4.38E-06	1.51	1.28		
33	exp14	1.83	5.61	4.03	4.83	4.74E-04	5.84E-06	1.39	1.20		
34	exp16	1.78	5.38	3.34	4.13	4.61E-04	4.84E-06	1.61	1.24		
35	exp20	1.89	5.15	3.45	4.75	4.90E-04	5.00E-06	1.49	1.38		
36	exp22	1.79	4.46	3.44	4.05	4.64E-04	4.99E-06	1.30	1.18		
37											
38	stroke	x1	x2	x3	y1	y2	y3	b (m)	ho (m)	gam1	gam2
39	exh1	16.02	16.28	16.48	6.64	5.16	5.78	0.0005	5E-06	1.29	1.12
40	exh3	15.96	16.27	16.45	7.36	4.97	5.34	0.0005	5E-06	1.46	1.07
41	exh5	15.98	18.3	18.51	8.74	5.96	7.42	0.0006	6E-06	1.47	1.24
42	exh7	18.04	16.34	16.53	7.24	5.27	5.9	0.0005	5E-06	1.37	1.12
43	exh9	15.9	16.28	16.46	8.98	5.4	8.04	0.0006	5E-06	1.66	1.12
44	exh11	15.86	16.16	16.4	7.94	5.02	5.84	0.0005	5E-06	1.56	1.16
45	exh13	15.81	16.18	16.37	7.81	4.26	6.36	0.0006	4E-06	1.62	1.49
46	exh15	15.74	16.1	16.3	7.73	4.26	6.25	0.0006	4E-06	1.61	1.47
47	exh17	15.74	16.09	16.25	8.04	5.5	6.7	0.0005	8E-06	1.46	1.22
48	exh19	15.92	16.31	16.5	8.52	4.77	7.08	0.0008	5E-06	1.79	1.46
49	exh21	15.76	18.23	16.42	10.55	5.06	7.69	0.0007	5E-08	2.08	1.51

	A	B	C	D	E	F	G	H	I	J	K
1	SBPM30.X										
2											
3	stroke	b ticks	h1 ticks	ho ticks	h2 tick	b (m)	ho (m)	gam1	gam2		
4	int2	1.05	2.82	2.06	2.21	0.00027195	3.02E-06	1.36	1.06		
5	int4	1.58	2.42	1.52	2.26	0.00040922	2.20E-06	1.59	1.50		
6	int6	1.27	2.79	2.06	2.27	0.00032893	3.02E-06	1.34	1.09		
7	int8	1.37	2.31	1.53	1.89	0.00035483	2.22E-06	1.51	1.24		
8	int10	1.4	1.85	1.07	1.4	0.0003626	1.55E-06	1.73	1.31		
9	int12	1.72	2.63	1.37	2.15	0.00044548	1.99E-06	1.92	1.57		
10	int14	1.62	1.66	1.37	1.79	0.00041958	1.99E-06	1.37	1.31		
11	int16	1.29	1.73	1.43	1.59	0.00033411	2.07E-06	1.21	1.11		
12	int18	0.98	2.03	1.76	1.82	0.00025382	2.55E-06	1.15	1.03		
13	int20	1.03	1.79	1.5	1.53	0.00026677	2.18E-06	1.19	1.02		
14	int22	1.02	1.94	1.38	1.63	0.00026418	2.00E-06	1.41	1.18		
15											
16	comp1	1.71	2.92	1.84	2.13	0.00044289	2.67E-06	1.59	1.16		
17	comp3	1.27	2.05	1.66	1.76	0.00032893	2.44E-06	1.22	1.05		
18	comp5	1.63	2.22	1.21	1.49	0.00042217	1.75E-06	1.83	1.23		
19	comp7	1.42	1.95	1.4	1.73	0.00036778	2.03E-06	1.39	1.24		
20	comp9	1.78	2.98	2.21	2.58	0.00046102	3.20E-06	1.35	1.17		
21	comp11	1.46	2.34	1.72	2.1	0.00038332	2.49E-06	1.36	1.22		
22	comp13	1.76	2.7	1.81	2.22	0.00045584	2.62E-06	1.49	1.23		
23	comp15	1.07	2.13	1.83	1.98	0.00027713	2.65E-06	1.16	1.08		
24	comp17	1.79	2.27	1.19	1.86	0.00046361	1.73E-08	1.91	1.56		
25	comp19	1.67	2.43	1.61	1.95	0.00043253	2.33E-06	1.51	1.21		
26	comp21	1.4	2.19	1.57	1.96	0.0003626	2.26E-06	1.39	1.25		
27											
28	exp1	1.24	1.76	1.41	1.66	0.00032116	2.04E-06	1.25	1.18		
29	exp3	1.37	1.87	1.39	1.68	0.00035483	2.02E-06	1.35	1.21		
30	exp5	0.96	1.28	0.82	0.96	0.00024864	1.19E-06	1.56	1.17		
31	exp7	1.07	2.09	1.32	1.55	0.00027713	1.91E-08	1.58	1.17		
32	exp9	1.31	1.48	1.06	1.29	0.00033929	1.54E-08	1.40	1.22		
33	exp11	1.26	1.73	1.22	1.43	0.00033152	1.77E-06	1.42	1.17		
34	exp13	1.07	1.81	1.43	1.5	0.00027713	2.07E-06	1.27	1.05		
35	exp15	1.02	1.97	1.53	1.67	0.00026416	2.22E-06	1.29	1.09		
36	exp17	1.16	1.31	0.91	1.11	0.00030044	1.32E-06	1.44	1.22		
37	exp19	1.26	1.21	0.71	0.97	0.00032634	1.03E-06	1.70	1.37		
38	exp21	1.06	1.68	1.11	1.33	0.00027454	1.61E-08	1.51	1.20		
39								b (m)	ho (m)	gam1	gam2
40	stroke	x1	x2	x3	y1	y2	y3				
41	exh2	15.87	16.14	16.32	2.53	1.3	1.7	5E-04	1E-06	1.95	1.31
42	exh4	15.8	16.04	16.21	1.91	1.06	1.29	4E-04	1E-06	1.80	1.22
43	exh8	15.87	16.09	16.27	2.31	1.5	1.91	4E-04	2E-06	1.54	1.27
44	exh8	15.99	16.19	16.37	2.41	1.62	1.8	4E-04	2E-06	1.49	1.11
45	exh12	15.98	16.2	16.36	2.9	1.86	2.08	4E-04	2E-06	1.54	1.11
46	exh14	16.06	16.27	16.46	3.41	2.42	2.95	4E-04	2E-08	1.41	1.22
47	exh16	15.89	16.15	16.36	2.9	1.82	2.19	5E-04	2E-06	1.79	1.35
48	exh18	15.71	16.01	16.21	3.7	2.08	2.82	5E-04	2E-06	1.78	1.36
49	exh22	15.69	15.93	16.15	3.17	1.98	2.38	5E-04	2E-08	1.60	1.19

	A	B	C	D	E	F	G	H	I	J	K
1	SBPS15.X										
2											
3	stroke	b ticks	h1 ticks	ho ticks	h2 ticks	b (m)	ho (m)	gam1	gam2		
4	int2	1.23	2.23	1.16	1.36	0.00031657	1.71E-06	1.89	1.17		
5	int4	1.9	2.63	0.97	1.92	0.0004921	1.41E-06	2.92	1.96		
6	int6	1.56	2.02	1.19	1.69	0.00040922	1.73E-06	1.70	1.59		
7	int10	1.7	1.8	1.01	1.66	0.0004403	1.46E-06	1.76	1.64		
8	int12	1.52	2.07	1.18	1.88	0.00039368	1.71E-06	1.75	1.59		
9	int16	1.26	2	1.42	1.68	0.00032634	2.08E-06	1.41	1.16		
10	int16	1.29	1.93	1.39	1.65	0.00033411	2.02E-06	1.39	1.19		
11	int20	1.69	2.58	1.32	1.98	0.00043771	1.91E-06	1.95	1.50		
12	int22	1.88	1.97	0.94	1.6	0.00043512	1.36E-06	2.10	1.70		
13											
14	comp1	1.71	2.06	1.19	1.77	0.00044289	1.73E-06	1.73	1.49		
15	comp3	1.85	2.08	1.3	1.82	0.00042735	1.89E-06	1.60	1.40		
16	comp5	2.03	2.98	1.52	1.62	0.00052577	2.20E-06	1.96	1.20		
17	comp7	1.48	2.3	1.59	1.67	0.00038332	2.31E-06	1.45	1.18		
18	comp9	2	3.88	1.82	2.62	0.000516	2.64E-06	2.13	1.44		
19	comp11	2.35	4.95	1.8	2.7	0.00060865	2.61E-08	2.75	1.50		
20	comp13	2.06	4.69	2.05	2.48	0.00053354	2.97E-06	2.29	1.21		
21	comp15	1.66	2.21	1.05	1.76	0.00048174	1.52E-06	2.10	1.70		
22	comp17	1.36	2.08	1.47	1.65	0.00035224	2.13E-06	1.41	1.12		
23	comp19	1.56	2.08	1.41	1.79	0.00040404	2.04E-06	1.46	1.27		
24	comp21	1.39	2.16	1.48	1.65	0.00036001	2.15E-06	1.46	1.25		
25											
26	exp1	1.41	2.08	1.21	1.76	0.00036519	1.75E-06	1.72	1.45		
27	exp3	1.17	2.17	1.28	1.59	0.00030303	1.86E-06	1.70	1.24		
28	exp5	1.32	1.7	1.2	1.49	0.00034186	1.74E-06	1.42	1.24		
29	exp7	1.24	1.52	1.04	1.27	0.00032116	1.51E-06	1.46	1.22		
30	exp9	1.63	1.96	0.96	1.66	0.00042217	1.42E-06	2.00	1.71		
31	exp11	1.42	1.7	1.03	1.58	0.00036778	1.49E-06	1.65	1.53		
32	exp13	1.21	2.15	1.19	1.42	0.00031339	1.73E-06	1.81	1.19		
33	exp15	1.69	1.7	0.88	1.49	0.00043771	1.28E-06	1.93	1.69		
34	exp17	1.42	2	1.22	1.51	0.00036778	1.77E-06	1.64	1.24		
35	exp19	1.42	2.08	1.03	1.41	0.00036778	1.49E-08	2.02	1.37		
36	exp21	1.4	1.42	0.69	1.37	0.0003626	1.29E-06	1.60	1.54		
37											
38	stroke	x1	x2	x3	y1	y2	y3	b (m)	ho (m)	gam1	gam2
39	exh2	15.75	16.07	16.22	2.04	0.8	1.3	0.0005	8E-07	2.55	1.63
40	exh4	15.7	15.92	16.12	2.59	1.55	2.22	0.0004	2E-06	1.67	1.43
41	exh6	15.71	16	16.18	3.24	1.2	1.62	0.0005	1E-06	2.70	1.35
42	exh6	15.88	15.98	16.16	3.33	0.81	1.23	0.0005	6E-07	4.11	1.52
43	exh10	15.77	16.02	16.22	2.39	0.94	1.4	0.0005	9E-07	2.54	1.49
44	exh12	15.88	18.01	16.2	4.03	1.38	2.01	0.0005	1E-06	2.92	1.46
45	exh14	15.71	16.04	16.2	2.99	1.27	1.65	0.0005	1E-06	2.35	1.30
46	exh16	15.84	16.09	16.27	2.32	1.4	2.32	0.0004	1E-06	1.66	1.66
47	exh18	15.71	15.9	16.09	2.15	1.5	1.87	0.0004	2E-06	1.43	1.25
48	exh20	15.79	16.09	16.24	2.17	1.37	1.63	0.0005	1E-06	1.56	1.34
49	exh22	15.74	16.02	16.21	2.8	1.56	1.78	0.0005	2E-06	1.79	1.14

	A	B	C	D	E	F	G	H	I	J	K
1	SBPS30.X										
2											
3	stroke	b ticks	h1 ticks	ho ticks	h2 ticks	b (m)	ho (m)	gam1	gam2		
4	int3	1.34	1.7	1.22	1.56	0.00034706	1.77E-06	1.39	1.30		
5	int5	1.29	2.38	1.46	1.75	0.00033411	2.12E-06	1.63	1.20		
6	int7	1.04	1.9	1.02	1.38	0.00026936	1.48E-06	1.66	1.35		
7	int9	1.35	1.7	1.06	1.45	0.00034965	1.57E-06	1.57	1.34		
8	int13	1.18	1.42	1.05	1.24	0.00030562	1.52E-06	1.35	1.18		
9	int15	1.18	1.3	0.91	1.16	0.00030562	1.32E-06	1.43	1.27		
10	int17	1.38	1.6	1.18	1.48	0.00035742	1.71E-08	1.36	1.25		
11											
12	comp2	1.34	1.37	0.93	1.18	0.00034706	1.35E-06	1.47	1.27		
13	comp4	1.78	1.83	0.96	1.42	0.00046102	1.42E-06	1.87	1.45		
14	comp6	1.21	1.02	0.73	0.97	0.00031339	1.06E-06	1.40	1.33		
15	comp8	1.61	1.7	1.08	1.4	0.00041699	1.54E-06	1.60	1.32		
18	comp10	1.82	1.58	0.74	1.23	0.00047138	1.07E-06	2.14	1.66		
17	comp12	1.68	1.36	0.65	1.07	0.00043512	9.43E-07	2.09	1.65		
18	comp14	1.7	1.52	0.88	1.14	0.0004403	1.28E-06	1.73	1.30		
19	comp16	1.69	2	0.9	1.4	0.00043771	1.31E-06	2.22	1.56		
20	comp18	1.42	1.52	1.2	1.5	0.00036776	1.74E-06	1.27	1.25		
21	comp20	1.73	1.7	1.06	1.39	0.00044807	1.54E-06	1.60	1.31		
22	comp22	1.41	1.47	1.06	1.19	0.00036519	1.54E-08	1.39	1.12		
23											
24	exp2	1.2	1.4	1.15	1.28	0.0003108	1.67E-06	1.22	1.11		
25	exp4	1.38	1.2	0.71	0.99	0.00035742	1.03E-06	1.69	1.39		
28	exp6	1.16	1.49	1.04	1.19	0.00030044	1.51E-06	1.43	1.14		
27	exp6	1.37	1.28	0.6	1	0.00035483	1.16E-06	1.60	1.25		
28	exp10	1.21	1.96	1.6	1.76	0.00031339	2.32E-06	1.24	1.10		
29	exp12	1.71	1.52	0.8	1.43	0.00044289	1.16E-06	1.90	1.79		
30	exp14	1.69	1.5	0.57	1.39	0.00043771	8.27E-07	2.83	2.44		
31	exp16	1.69	1.43	0.7	1.4	0.00043771	1.02E-06	2.04	2.00		
32	exp18	1.32	1.32	0.73	1.09	0.00034188	1.06E-06	1.81	1.49		
33	exp20	1.32	1.6	1.3	1.45	0.00034188	1.89E-08	1.23	1.12		
34	exp22	1.26	1.27	0.7	1.05	0.00032634	1.02E-06	1.81	1.50		
35											
38	stroke	x1	x2	x3	y1	y2	y3	b (m)	ho (m)	gam1	gam2
37	exh1	15.69	15.99	16.13	2.01	1.04	1.64	0.00044	1.04E-06	1.93	1.58
38	exh3	15.85	15.98	16.18	1.42	0.85	1.31	0.00033	8.5E-07	1.67	1.54
39	exh5	15.65	15.92	16.08	1.95	1.06	1.46	0.00043	1.06E-06	1.84	1.38
40	exh7	15.61	15.87	16.04	2.43	1.12	1.34	0.00043	1.12E-06	2.17	1.20
41	exh9	15.49	15.72	15.87	2.92	1.75	1.9	0.00036	1.75E-06	1.67	1.09
42	exh11	15.68	15.94	16.12	1.66	1	1.35	0.00044	0.000001	1.86	1.35
43	exh13	15.71	15.97	18.15	2.02	0.8	1.52	0.00044	8E-07	2.53	1.90
44	exh15	15.72	15.97	16.15	2.17	1.17	1.41	0.00043	1.17E-06	1.65	1.21
45	exh17	15.6	15.66	16.05	2.27	1.24	1.54	0.00045	1.24E-06	1.83	1.24

	A	B	C	D	E	F	G	H	I	J	K
1	SMCM10F										
2											
3	stroke	x1	x2	x3	y1	y2	y3	b (m)	ho (m)	gam1	gam2
4	int1	-15.04	-14.88	-14.69	2.08	1.42	2.05	0.00035	0.00000142	1.46	1.44
5	int3	-15.18	-14.94	-14.73	3.13	2.14	3.26	0.00045	0.00000214	1.46	1.52
6	int5	-15.14	-14.92	-14.78	2.82	1.98	2.71	0.00038	0.00000198	1.42	1.37
7	int7	-15.19	-15.02	-14.86	2.65	2.25	2.41	0.00033	0.00000225	1.18	1.07
8	int9	-15.18	-14.99	-14.72	3.18	1.93	3.14	0.00048	0.00000193	1.65	1.83
9	int11	-15.13	-14.92	-14.84	2.98	2.28	2.42	0.00029	0.00000228	1.31	1.06
10	int13	-15.11	-14.89	-14.76	2.52	1.92	2.4	0.00035	0.00000192	1.31	1.25
11	int15	-15.11	-14.94	-14.74	2.44	1.51	2.34	0.00037	0.00000151	1.62	1.55
12											
13	comp2	18.71	18.95	17.14	2.84	1.93	2.38	0.00043	0.00000193	1.47	1.23
14	comp4	16.88	16.89	17.07	2.13	1.38	2.08	0.00039	0.00000136	1.57	1.51
15	comp6	16.84	16.89	17.06	2.44	1.53	2.08	0.00042	0.00000153	1.59	1.38
16	comp8	18.88	18.91	17.09	2.47	1.58	2.12	0.00041	0.00000158	1.58	1.34
17	comp10	18.7	18.99	17.17	3.19	1.84	2.63	0.00047	0.00000184	1.73	1.43
18	comp12	16.58	16.97	17.13	5.01	1.91	3.16	0.00055	0.00000191	2.82	1.65
19	comp14	16.65	18.91	17.09	2.43	1.48	1.75	0.00044	0.00000148	1.88	1.20
20											
21	pwr2	-15.23	-15.07	-14.81	1.15	0.99	2.22	0.00042	0.00000099	1.16	2.24
22	pwr4	-15.3	-15.12	-14.94	1.61	1.03	1.8	0.00036	0.00000103	1.58	1.55
23	pwr6	-15.33	-15.18	-15	1.8	0.93	1.34	0.00033	0.00000093	1.72	1.44
24	pwr8	-15.29	-15.12	-14.95	1.06	0.56	1.17	0.00034	0.00000056	1.89	2.09
25	pwr10	-15.3	-15.11	-14.95	1.4	0.88	1.43	0.00035	0.00000088	1.59	1.63
26	pwr12	-15.26	-15.07	-14.91	1.35	1	1.38	0.00035	0.000001	1.35	1.38
27	pwr14	-15.3	-15.1	-14.95	1.59	1.28	1.61	0.00035	0.00000128	1.24	1.26
28											
29	exh1	18.73	16.94	17.06	1.8	1.35	1.42	0.00033	0.00000135	1.19	1.05
30	exh3	18.74	16.98	17.1	2.06	1.4	1.81	0.00036	0.0000014	1.47	1.29
31	exh5	16.67	16.93	17.1	2.86	1.47	1.96	0.00043	0.00000147	1.81	1.33
32	exh7	16.79	17.02	17.15	2.13	1.38	1.94	0.00038	0.00000138	1.54	1.41
33	exh9	16.7	17.01	17.14	2.78	1.7	2.13	0.00044	0.0000017	1.64	1.25
34	exh11	16.77	16.94	17.11	1.78	1.48	1.77	0.00034	0.00000148	1.20	1.20
35	exh13	16.78	16.98	17.14	2.2	1.88	2.18	0.00036	0.00000168	1.31	1.30
38	exh15	18.77	16.95	17.12	1.97	1.6	2.01	0.00035	0.0000016	1.23	1.28

	A	B	C	D	E	F	G	H	I	J	K
1	SMHS10H										
2											
3	stroke	x1	x2	x3	y1	y2	y3	b (m)	ho (m)	gam1	gam2
4	int1	-14.78	-14.62	-14.51	2.25	1.76	1.91	0.00027	0.00000176	1.28	1.09
5	int3	-14.79	-14.58	-14.34	2.85	1.93	2.81	0.00045	0.00000193	1.48	1.46
6	int5	-14.83	-14.83	-14.47	2.58	1.74	2.04	0.00038	0.00000174	1.48	1.17
7	int7	-14.78	-14.58	-14.34	2.98	1.88	2.73	0.00044	0.00000188	1.59	1.45
8	int9	-14.76	-14.58	-14.37	2.12	1.58	2.18	0.00039	0.00000158	1.34	1.37
9	int11	-14.69	-14.5	-14.35	2.64	2.23	2.81	0.00034	0.00000223	1.18	1.17
10	int13	-14.66	-14.48	-14.4	2.46	2.1	2.28	0.00026	0.0000021	1.17	1.09
11	int15	-14.77	-14.6	-14.48	2.86	2.29	2.41	0.00029	0.00000229	1.25	1.05
12											
13	comp2	15.3	15.47	15.64	1.21	0.8	0.93	0.00034	0.0000008	1.51	1.16
14	comp4	15.33	15.51	15.69	1.08	0.51	1.08	0.00038	0.00000051	2.08	2.08
15	comp8	15.38	15.54	15.71	1.57	1.14	1.54	0.00035	0.00000114	1.38	1.35
16	comp8	15.18	15.45	15.65	2.01	0.7	1.3	0.00047	0.0000007	2.87	1.88
17	comp10	15.18	15.45	15.63	2.01	0.88	1.31	0.00045	0.00000088	2.28	1.49
18	comp12	15.3	15.56	15.74	1.7	0.88	1.33	0.00044	0.00000068	2.50	1.98
19	comp14	15.39	15.56	15.75	1.24	0.87	1.11	0.00038	0.00000087	1.85	1.88
20											
21	pwr2	-15.15	-14.99	-14.82	0.68	0.52	0.83	0.00033	0.00000052	1.31	1.80
22	pwr4	-15.34	-15.17	-15.04	1.43	1.05	1.23	0.0003	0.00000105	1.36	1.17
23	pwr6	-15.27	-15.09	-15	1.51	1.15	1.31	0.00027	0.00000115	1.31	1.14
24	pwr8	-15.05	-14.87	-14.73	0.88	0.58	0.79	0.00032	0.00000058	1.52	1.38
25	pwr10	-15.28	-15.1	-15.01	1.58	1.13	1.14	0.00027	0.00000113	1.40	1.01
26	pwr12	-15.18	-15.03	-14.94	1.06	0.85	0.88	0.00024	0.00000085	1.25	1.04
27	pwr14	-15.22	-15.05	-14.89	1.07	0.65	0.87	0.00033	0.00000065	1.65	1.34
28											
29	exh1	15.35	15.5	15.68	1.38	0.81	1.35	0.00033	0.00000081	1.70	1.87
30	exh3	15.33	15.5	15.69	1.66	1.08	1.69	0.00038	0.00000108	1.54	1.56
31	exh5	15.37	15.57	15.75	1.95	1.38	1.49	0.00038	0.00000138	1.41	1.08
32	exh7	15.35	15.51	15.66	1.89	1.36	1.59	0.00031	0.00000136	1.39	1.17
33	exh9	15.26	15.43	15.59	1.37	0.96	1.16	0.00033	0.00000096	1.43	1.21
34	exh11	15.3	15.45	15.63	2.05	1.52	1.89	0.00033	0.00000152	1.35	1.11
35	exh13	15.32	15.59	15.76	2.15	0.81	1.25	0.00044	0.00000081	2.65	1.54
36	exh15	15.31	15.49	15.67	1.47	1.11	1.43	0.00038	0.00000111	1.32	1.29

	A	B	C	D	E	F	G	H	I	J	K
1	SMHS20F										
2											
3	stroke	x1	x2	x3	y1	y2	y3	b (m)	ho (m)	gam1	gam2
4	int1	-16.75	-16.58	-16.43	0.98	0.7	0.96	0.00032	0.0000007	1.40	1.37
5	int3	-16.73	-16.57	-16.47	1.14	0.82	1	0.00026	0.00000082	1.39	1.22
6	int5	-16.67	-16.48	-16.35	0.77	0.62	1.01	0.00032	0.00000062	1.24	1.63
7	int7	-16.73	-16.54	-16.45	1.15	0.85	0.89	0.00028	0.00000085	1.35	1.05
8	int9	-18.66	-16.51	-16.35	0.96	0.78	1.08	0.00031	0.00000078	1.23	1.38
9	int11	-16.82	-16.66	-16.54	0.74	0.38	0.56	0.00028	0.00000038	1.95	1.47
10	int13	-16.78	-16.82	-16.55	0.7	0.59	0.68	0.00023	0.00000059	1.19	1.15
11	int15	-16.23	-16.02	-15.89	0.75	0.5	0.8	0.00034	0.0000005	1.50	1.60
12	int17	-18.32	-16.16	-16.07	0.92	0.76	0.82	0.00025	0.00000076	1.21	1.08
13	int19	-16.72	-16.55	-16.47	1.13	0.9	1.03	0.00025	0.0000009	1.26	1.14
14	int21	-16.4	-16.22	-16.14	0.89	0.6	0.61	0.00026	0.0000006	1.48	1.02
15	int23	-16.3	-16.1	-15.96	0.71	0.52	0.71	0.00034	0.00000052	1.37	1.37
16	int25	-16.84	-16.7	-16.58	1.17	0.82	1.02	0.00026	0.00000082	1.43	1.24
17	int27	-18.55	-16.37	-18.21	0.79	0.49	0.66	0.00034	0.00000049	1.61	1.35
18											
19	comp2	15.01	15.15	15.34	1.01	0.73	0.92	0.00033	0.00000073	1.38	1.26
20	comp4	15.05	15.22	15.37	1	0.77	0.97	0.00032	0.00000077	1.30	1.26
21	comp6	14.97	15.16	15.3	1.16	0.83	1.07	0.00033	0.00000083	1.40	1.29
22	comp8	14.92	15.13	15.28	1.42	1.07	1.44	0.00036	0.00000107	1.33	1.35
23	comp10	14.75	14.93	15.08	1.19	0.86	1	0.00033	0.00000086	1.38	1.16
24	comp12	14.93	15.11	15.28	1.33	0.99	1.28	0.00035	0.00000099	1.34	1.29
25	comp14	15.07	15.23	15.37	1.29	0.95	1.08	0.0003	0.00000095	1.36	1.12
26	comp16	15.05	15.14	15.3	0.65	0.56	0.7	0.00025	0.00000058	1.16	1.25
27	comp18	15.02	15.14	15.31	1.1	0.9	1.05	0.00029	0.0000009	1.22	1.17
28	comp20	14.88	15.06	15.21	1.33	1.08	1.31	0.00033	0.00000108	1.23	1.21
29	comp22	15.04	15.18	15.33	1.38	1.09	1.18	0.00029	0.00000109	1.27	1.08
30	comp24	15.1	15.23	15.38	1.16	0.9	0.97	0.00028	0.0000009	1.29	1.08
31	comp26	14.97	15.13	15.3	1.26	1.12	1.12	0.00033	0.00000112	1.13	1.00
32	comp28	14.94	15.13	15.28	0.96	0.69	0.8	0.00034	0.00000069	1.39	1.16
33											
34	pwr2	-15.23	-15.09	-15	0.64	0.4	0.44	0.00023	0.0000004	1.60	1.10
35	pwr4	-15.47	-15.31	-15.22	0.83	0.72	0.77	0.00025	0.00000072	1.15	1.07
36	pwr6	-15.39	-15.22	-15.15	0.6	0.45	0.46	0.00024	0.00000045	1.33	1.02
37	pwr8	-15.44	-15.31	-15.22	0.68	0.56	0.66	0.00022	0.00000056	1.21	1.16
38	pwr10	-15.29	-15.15	-15.05	0.9	0.6	0.78	0.00024	0.0000006	1.50	1.30
39	pwr12	-15.07	-14.89	-14.81	0.76	0.51	0.61	0.00026	0.00000051	1.49	1.20
40	pwr14	-15.41	-15.22	-15.11	0.67	0.57	0.71	0.0003	0.00000057	1.18	1.25
41	pwr16	-15.53	-15.38	-15.28	0.35	0.16	0.22	0.00025	0.00000016	2.19	1.38
42	pwr18	-16.13	-15.97	-15.88	0.7	0.46	0.48	0.00025	0.00000048	1.52	1.04
43	pwr20	-15.34	-15.18	-15.02	0.68	0.54	0.79	0.00032	0.00000054	1.22	1.48
44	pwr22	-15.33	-15.19	-15.1	0.67	0.59	0.62	0.00023	0.00000059	1.14	1.05
45	pwr24	-15.35	-15.21	-15.04	0.58	0.46	0.8	0.00031	0.00000046	1.26	1.74
46	pwr26	-15.49	-15.34	-15.24	0.74	0.58	0.6	0.00025	0.00000058	1.28	1.03
47	pwr28	-15.5	-15.34	-15.19	0.88	0.51	0.87	0.00031	0.00000051	1.33	1.31
48											
49	exh1	14.93	15.05	15.17	0.89	0.85	0.88	0.00024	0.00000085	1.05	1.04
50	exh3	14.52	14.67	14.83	1.41	0.97	1.2	0.00031	0.00000097	1.45	1.24
51	exh5	14.69	14.87	15	1.34	1.1	1.2	0.00031	0.0000011	1.22	1.09
52	exh7	14.61	14.76	14.93	0.99	0.64	0.76	0.00032	0.00000064	1.55	1.19
53	exh9	14.78	14.93	15.1	1.22	0.88	1.11	0.00032	0.00000088	1.39	1.26
54	exh11	14.77	14.94	15.1	1.01	0.7	1	0.00033	0.0000007	1.44	1.43
55	exh13	14.52	14.71	14.85	1.23	0.81	0.88	0.00033	0.00000081	1.52	1.09
58	exh15	14.9	15.01	15.16	0.48	0.36	0.56	0.00026	0.00000036	1.33	1.56
57	exh17	14.78	14.96	15.12	0.91	0.64	0.84	0.00034	0.00000064	1.42	1.31
58	exh19	14.82	15.02	15.18	1.62	1.13	1.49	0.00034	0.00000113	1.43	1.32
59	exh21	14.81	14.96	15.12	1.24	0.99	1.12	0.00031	0.00000099	1.25	1.13
60	exh23	14.78	14.89	15.01	0.99	0.93	0.94	0.00023	0.00000093	1.06	1.01
81	exh25	14.77	14.92	15.09	1.41	1.25	1.41	0.00032	0.00000125	1.13	1.13
82	exh27	14.87	15.01	15.17	1.12	0.81	1.08	0.0003	0.00000081	1.38	1.33

	A	B	C	D	E	F	G	H	I	J	K
1	SMHS25H										
2											
3	stroke	x1	x2	x3	y1	y2	y3	b (m)	ho (m)	gam1	gam2
4	int1	-15.51	-15.35	-15.26	1.41	1.12	1.17	0.00025	0.00000112	1.26	1.04
5	int3	-15.19	-15.06	-14.96	0.97	0.79	0.83	0.00023	0.00000079	1.23	1.05
6	int5	-14.69	-14.55	-14.46	1.16	1.02	1.05	0.00023	0.00000102	1.14	1.03
7	int7	-14.94	-14.62	-14.72	0.97	0.76	0.66	0.00022	0.00000076	1.26	1.16
8	int9	-15.04	-14.67	-14.79	1.27	1.01	1.09	0.00025	0.00000101	1.26	1.08
9	int11	-14.9	-14.73	-14.63	1.42	1.17	1.26	0.00027	0.00000117	1.21	1.09
10	int13	-14.93	-14.6	-14.72	0.66	0.6	0.72	0.00021	0.0000006	1.13	1.20
11	int15	-14.8	-14.69	-14.58	0.91	0.63	0.69	0.00022	0.00000063	1.44	1.10
12	int17	-15.14	-15	-14.89	1.38	1.16	1.31	0.00025	0.00000116	1.19	1.13
13	int19	-15.27	-15.06	-15.01	1.29	1.08	1.15	0.00026	0.00000106	1.19	1.06
14	int21	-15.17	-15	-14.9	1.24	0.99	1.17	0.00027	0.00000099	1.25	1.16
15	int23	-15.13	-14.96	-14.86	1.19	1.01	1.11	0.00027	0.00000101	1.16	1.10
16	int25	-15.03	-14.89	-14.79	1.1	0.91	1.05	0.00024	0.00000091	1.21	1.15
17	int27	-15.18	-15.04	-14.94	1.41	1.23	1.33	0.00024	0.00000123	1.15	1.06
18											
19	comp2	14.51	14.66	14.64	1.22	0.63	1.02	0.00033	0.00000063	1.47	1.23
20	comp4	14.04	14.2	14.36	1.57	1.43	1.53	0.00032	0.00000143	1.10	1.07
21	comp6	14.84	14.93	15.07	1.17	1.01	1.13	0.00023	0.00000101	1.16	1.12
22	comp8	14.65	15.02	15.16	1.72	1.39	1.43	0.00031	0.00000139	1.24	1.03
23	comp10	14.87	15.04	15.17	1.25	0.94	1.03	0.0003	0.00000094	1.33	1.10
24	comp12	14.88	15.05	15.21	1.51	1.09	1.41	0.00033	0.00000109	1.39	1.29
25	comp14	14.86	15.04	15.2	0.67	0.54	0.62	0.00034	0.00000054	1.61	1.52
26	comp16	14.63	14.94	15.06	1.03	0.66	1.06	0.00025	0.00000066	1.20	1.26
27	comp18	14.94	15.12	15.26	1.21	0.92	1.14	0.00032	0.00000092	1.32	1.24
26	comp20	14.65	15.01	15.1	1.31	0.97	1.06	0.00025	0.00000097	1.35	1.09
29	comp22	14.66	15.03	15.17	1.72	1.45	1.66	0.00031	0.00000145	1.19	1.16
30	comp24	14.8	14.95	15.09	0.92	0.69	0.61	0.00029	0.00000069	1.33	1.17
31	comp26	14.75	14.85	14.98	1.05	0.9	0.96	0.00023	0.0000009	1.17	1.07
32	comp28	14.44	14.62	14.76	1.13	0.76	1.03	0.00032	0.00000076	1.49	1.36
33											
34	pwr2	-15.23	-15.07	-14.69	1.13	0.64	1.14	0.00034	0.00000084	1.35	1.36
35	pwr4	-15.44	-15.26	-15.19	0.96	0.69	0.9	0.00025	0.00000089	1.10	1.01
36	pwr6	-15.01	-14.87	-14.77	1.17	1.05	1.17	0.00024	0.00000105	1.11	1.11
37	pwr8	-15.04	-14.68	-14.76	0.77	0.6	0.67	0.00026	0.0000006	1.28	1.12
38	pwr10	-15.54	-15.41	-15.31	0.71	0.61	0.71	0.00023	0.00000061	1.16	1.16
39	pwr12	-15.45	-15.29	-15.21	1.26	1.09	1.11	0.00024	0.00000109	1.16	1.02
40	pwr14	-15.14	-14.99	-14.64	0.79	0.5	0.72	0.0003	0.0000005	1.58	1.44
41	pwr16	-14.9	-14.73	-14.57	1.01	0.79	1.03	0.00033	0.00000079	1.26	1.30
42	pwr18	-15.12	-14.96	-14.66	0.93	0.66	0.94	0.00024	0.00000066	1.06	1.09
43	pwr20	-15.22	-15.06	-14.96	0.77	0.58	0.78	0.00026	0.00000058	1.33	1.34
44	pwr22	-15.34	-15.19	-15.09	0.64	0.68	0.61	0.00025	0.00000068	1.24	1.19
45	pwr24	-15.46	-15.29	-15.2	0.85	0.59	0.72	0.00026	0.00000059	1.44	1.22
46	pwr26	-15.56	-15.39	-15.24	1.09	1	1.17	0.00032	0.000001	1.09	1.17
47	pwr28	-15.49	-15.3	-15.22	1.15	0.89	0.92	0.00027	0.00000089	1.29	1.03
48											
49	exh1	14.83	14.98	15.14	1.02	0.79	0.86	0.00031	0.00000079	1.29	1.09
50	exh3	15.18	15.38	15.44	1.58	1.33	1.35	0.00026	0.00000133	1.19	1.02
51	exh5	14.85	15.01	15.13	1.13	0.9	0.95	0.00028	0.0000009	1.26	1.06
52	exh7	15.17	15.33	15.49	1.6	1.35	1.52	0.00032	0.00000135	1.19	1.13
53	exh9	14.76	14.92	15.08	1.36	1.1	1.32	0.0003	0.0000011	1.24	1.20
54	exh11	14.84	14.95	15.11	1.5	1.3	1.45	0.00027	0.0000013	1.15	1.12
55	exh13	14.66	14.82	14.97	1.1	0.9	0.96	0.00029	0.0000009	1.22	1.07
56	exh15	14.51	14.65	14.82	1.32	1.05	1.12	0.00031	0.00000105	1.26	1.07
57	exh17	14.74	14.91	15.06	1.16	0.86	0.99	0.00032	0.00000068	1.32	1.13
56	exh19	14.8	14.95	15.1	1.21	1.03	1.15	0.0003	0.00000103	1.17	1.12
59	exh21	14.87	15.03	15.18	0.79	0.61	0.76	0.00031	0.00000061	1.30	1.25
60	exh23	14.82	14.99	15.14	1.28	1.12	1.22	0.00032	0.00000112	1.14	1.09
61	exh25	14.86	14.99	15.12	0.95	0.82	0.93	0.00026	0.00000082	1.16	1.13
62	exh27	14.86	15.01	15.17	1.32	1.04	1.25	0.00031	0.00000104	1.27	1.20

	A	B	C	D	E	F	G	H	I	J	K
1	SMMM10F										
2											
3	stroke	x1	x2	x3	y1	y2	y3	b (m)	ho (m)	gam1	gam2
4	int2	-15.12	-14.94	-14.76	1.65	1.12	1.44	0.00034	0.00000112	1.47	1.29
5	int4	-15.22	-15.05	-14.9	1.56	1.32	1.59	0.00032	0.00000132	1.20	1.20
6	int6	-15.08	-14.92	-14.74	1.41	1	1.19	0.00034	0.000001	1.41	1.19
7	int8	-15.39	-15.22	-15.08	1.53	1.06	1.39	0.00031	0.00000106	1.44	1.31
8	int10	-15.02	-14.65	-14.69	1.42	1.11	1.44	0.00033	0.00000111	1.28	1.30
9	int12	-15.33	-15.17	-15.05	1.39	1.04	1.37	0.00026	0.00000104	1.34	1.32
10	int14	-15.09	-14.91	-14.76	1.43	1.07	1.29	0.00033	0.00000107	1.34	1.21
11											
12	comp1	15.78	15.98	16.15	1.61	0.99	1.56	0.00037	0.00000099	1.63	1.58
13	comp3	15.88	16.03	16.19	1.61	1.11	1.43	0.00031	0.00000111	1.45	1.29
14	comp5	15.61	15.96	16.14	1.29	0.97	1.34	0.00033	0.00000097	1.33	1.38
15	comp7	15.67	15.91	16.06	1.61	0.76	1.26	0.00041	0.0000076	2.06	1.64
16	comp9	15.84	16.02	16.19	1.58	1.13	1.44	0.00035	0.00000113	1.40	1.27
17	comp11	15.72	15.69	16.07	1.57	1.14	1.42	0.00035	0.00000114	1.38	1.25
18	comp13	15.63	16	16.16	1.44	0.84	1.39	0.00035	0.00000084	1.71	1.65
19	comp15	15.7	15.94	16.12	1.77	0.84	1.13	0.00042	0.00000064	2.11	1.35
20											
21	pwr3	-15	-14.82	-14.7	1.21	1	1.2	0.0003	0.000001	1.21	1.20
22	pwr5	-15.26	-15.08	-15.01	1.35	1.01	1.23	0.00025	0.00000101	1.34	1.22
23	pwr7	-14.88	-14.87	-14.53	1.54	1.2	1.58	0.00035	0.0000012	1.28	1.32
24	pwr9	-15	-14.64	-14.75	1.51	1.25	1.33	0.00025	0.00000125	1.21	1.06
25	pwr11	-15.08	-14.68	-14.73	1.27	0.79	1.13	0.00035	0.00000079	1.61	1.43
26	pwr13	-15.2	-15.03	-14.86	1.12	0.82	1.21	0.00034	0.00000062	1.37	1.48
27	pwr15	-14.98	-14.81	-14.68	1.66	1.26	1.43	0.0003	0.00000126	1.32	1.13
28											
29	exh2	15.74	15.93	16.08	1.32	0.9	1.13	0.00034	0.0000009	1.47	1.26
30	exh4	15.73	15.97	16.13	1.66	0.9	1.54	0.0004	0.0000009	1.64	1.71
31	exh6	15.6	15.76	15.96	1.32	0.81	1.29	0.00036	0.00000061	1.63	1.59
32	exh8	15.74	15.9	16.05	1.33	0.99	1.06	0.00031	0.00000099	1.34	1.07
33	exh10	15.83	16	16.19	1.46	0.69	1.41	0.00036	0.00000089	1.66	1.58
34	exh12	15.75	15.96	16.14	1.66	0.93	1.26	0.00039	0.00000093	1.81	1.35
35	exh14	15.72	15.96	16.13	1.61	0.75	1.25	0.00041	0.00000075	2.15	1.67

	A	B	C	D	E	F	G	H	I	J	K
1	SMCM20.X										
2											
3	stroke	x1	x2	x3	y1	y2	y3	b (m)	ho (m)	gam1	gam2
4	exh1	15.94	18.85	17.03	24.31	2.98	4.6	0.00109	0.00000298	8.16	1.54
5	exh3	16	18.88	17.05	27.76	2.59	5.97	0.00105	0.00000259	10.72	2.31
8	exh5	15.95	18.82	17.01	28.72	3.45	4.85	0.00108	0.00000345	8.32	1.41
7	exh7	16	16.89	17.08	27.26	3.38	5.94	0.00108	0.00000336	8.11	1.77
8	exh9	15.9	18.83	17	28.07	3.36	4.75	0.0011	0.00000338	8.35	1.41
9	exh11	15.86	18.85	17.04	37.28	3.6	5.38	0.00118	0.0000038	10.36	1.49
10	exh15	15.94	18.86	17.04	33.15	3.25	4.58	0.0011	0.00000325	10.20	1.40
11	exh17	16	18.9	17.08	28.24	2.04	4.95	0.00108	0.00000204	13.84	2.43
12	exh19	15.99	16.89	17.06	29.91	4.51	6.89	0.00107	0.00000451	8.83	1.53
13	exh21	15.96	16.84	17.02	24.85	2.91	4.52	0.00108	0.00000291	8.54	1.55

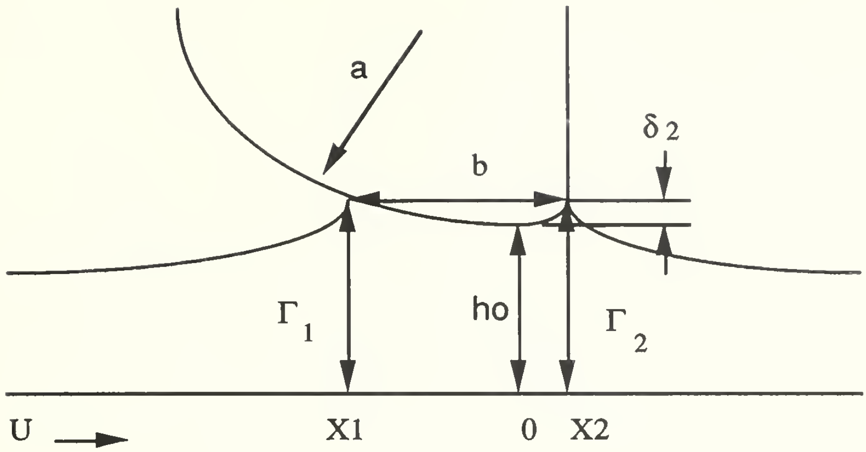
	A	B	C	D	E	F	G	H	I	J	K
1	SMHS10.X										
2											
3	stroke	x1	x2	x3	y1	y2	y3	b (m)	ho (m)	gam1	gam2
4	exh1	15.97	16.23	16.39	2.95	2.1	2.53	0.00042	0.0000021	1.40	1.20
5	exh3	16.08	16.3	16.46	2.87	1.78	2.62	0.00038	0.00000178	1.61	1.47
8	exh5	16	16.31	16.45	3.44	2.35	2.9	0.00045	0.00000235	1.46	1.23
7	exh7	15.96	16.23	16.42	3.36	1.92	2.24	0.00046	0.00000192	1.75	1.17
8	exh9	16.08	16.28	16.48	3.15	2.35	3.03	0.0004	0.00000235	1.34	1.29
9	exh11	15.95	16.17	16.35	3.47	2.32	2.76	0.0004	0.00000232	1.50	1.19
10	exh13	15.88	16.05	16.25	2.93	2.28	2.53	0.00037	0.00000228	1.29	1.11
11	exh15	18.05	18.29	16.47	2.52	1.46	2	0.00042	0.00000148	1.73	1.37

	A	B	C	D	E	F	G	H	I	J	K
1	SMHS25.X										
2											
3	stroke	x1	x2	x3	y1	y2	y3	b (m)	ho (m)	gam1	gam2
4	exh1	15.96	16.2	16.32	2.67	2.13	2.71	0.00036	0.00000213	1.25	1.27
5	exh3	15.9	16.16	16.33	2.74	1.98	2.29	0.00043	0.00000198	1.38	1.16
6	exh5	15.77	15.99	16.18	2.43	1.51	1.98	0.00041	0.00000151	1.61	1.31
7	exh7	15.81	15.97	16.14	1.83	1.24	1.52	0.00033	0.00000124	1.48	1.23
8	exh9	15.69	15.93	16.12	2.86	1.82	2.16	0.00043	0.00000182	1.57	1.19
9	exh11	15.78	15.98	16.16	2.09	1.63	1.82	0.00038	0.00000163	1.28	1.12
10	exh13	15.78	16.01	16.22	2.87	2	2.3	0.00044	0.000002	1.44	1.15
11	exh15	15.77	15.98	16.17	2.51	1.87	2.19	0.0004	0.00000187	1.34	1.17
12	exh17	16	16.2	16.33	2.65	2.14	2.59	0.00033	0.00000214	1.24	1.21
13	exh19	15.82	16.01	16.1	2.87	2.55	2.8	0.00028	0.00000255	1.13	1.10
14	exh21	15.87	16	16.19	1.61	1.36	1.54	0.00032	0.00000136	1.18	1.13

	A	B	C	D	E	F	G	H	I	J	K
1	SMMM20.X										
2											
3	stroke	x1	x2	x3	y1	y2	y3	b (m)	ho (m)	gam1	gam2
4	exh1	15.6	15.91	16.04	4.26	2.72	2.94	0.00044	0.00000272	1.57	1.06
5	exh3	15.56	15.66	15.99	3.44	2.06	2.29	0.00043	0.00000206	1.67	1.11
6	exh5	15.61	15.64	16.03	3.19	2.07	2.2	0.00042	0.00000207	1.54	1.06
7	exh7	15.61	15.96	16.13	2.33	2.1	2.11	0.00032	0.0000021	1.11	1.00
8	exh9	15.77	16	16.12	2.87	2.35	2.65	0.00035	0.00000235	1.22	1.13
9	exh11	15.57	15.85	15.99	2.93	1.64	1.93	0.00042	0.00000164	1.79	1.18
10	exh13	15.64	15.9	16.07	2.7	1.81	2.11	0.00043	0.00000161	1.49	1.17
11	exh15	15.62	15.89	16.04	3.23	2.27	2.29	0.00042	0.00000227	1.42	1.01
12	exh17	15.7	15.88	16.03	2.3	1.73	2.09	0.00033	0.00000173	1.33	1.21

	A	B	C	D	E	F	G	H
1	Motored constants *****							
2								
3	data s	oil	T liner (deg C	U (m/s)	μ (Pa s)	B (m)	ΔP (Pa)	a (m)
4	203	cm	92.7	7.33	0.01037	0.00146	193000	0.065
5	251	hs	73	3.67	0.01721			
6	254	hs	101.3	9.16	0.00792	ΔPB=	281.78	
7	303	mm	92.7	7.33	0.01268			
8	519	pm	83.3	5.5	0.01270			
9	520	pm	111.2	11	0.00718			
10	524	ps	83.3	5.5	0.01286			
11	525	ps	111.2	11	0.00668			
12								
13	Fired constants *****							
14								
15	data s	oil	T liner (deg C	U (m/s)	μ (Pa s)	B (m)	ΔP (Pa)	a (m)
16	207	cm	132	3.67	0.00500	0.00146	193000	0.065
17	258	hs	106	3.67	0.00711			
18	263	hs	150	7.33	0.00317	ΔPB=	281.78	
19	268	hs	147	9.16	0.00332			
20	306	mm	132	3.67	0.00603	wrist pin oil thick correction factor		
21	521	pm	141	5.5	0.00445	1500 rpm	1.61	
22	522	pm	160	11	0.00345	3000 rpm	1.55	
23	526	ps	141	5.5	0.00392			
24	527	ps	160	11	0.00297			

Appendix C - Upstroke Model Development



Definition of terms used for profile of second ring as defined by Coyne and Elrod [7]:

Γ_1 - nondimensional inlet wetting height

Γ_2 - nondimensional outlet wetting height

ho - minimum wetting height

X1 - local position of Γ_1 relative to 0

0 - local position of ho

X2 - local position of Γ_2 relative to 0

a - radius of parabolic fit of ring tip

b - wetted length

δ_2 - Γ_2 - ho

The formula describing the oil height under the ring is

$$h(x) = ho + \frac{(x-x_0)^2}{2a}$$

where $x_o = 0$ (local position of ho). Based on inputs b, Γ_2 with a, δ_2 and X2 known from the scraper ring talysurf calculations, ho and Γ_1 can be determined using the above equation.

These parameters are used in an Excel macro called "Macro 9". Macro 9 is an iterative scheme to compute f, Γ_1, b and h_∞ from a, X2, Γ_2 and W (load). X2 is the separation location measured from the point on the ring where h = ho. There is a main program and five subroutines called K, Ksub1, hinfh0, loc1 and h0. The subroutine hinfh0 calculates hinf/ho. K and Ksub1 calculate the values of K in the formulae of Coyne and Elrod while loc1 calculates the value of X1 (the distance under the ring from the inlet to the point where h = ho, nondimensionalized). The subroutine h0 calculates ho. Main calls h0 which calculates ho directly from Γ_2, X2 and a. Then the nondimensional variables for X2 and W are calculated. The accuracy constant, called eps for epsilon in the code, is assumed at 0.0001. The iteration variable is X1 which is looped in main through subroutine loc1. Loc1 calls three subroutines, hinfh0, K and Ksub1. Each uses the formulae given in Coyne and Elrod [7]. Loc1 is a root solver using a bisection technique to guess the most accurate X1, the root of the equation for Wcalc - W, where Wcalc is the load calculated from all other variables. The bisection technique progressively narrows the location of the root down until the accuracy criterion is met. The last guess of X1 is then sent back to main where the entire loop is done again until X1 converges to the accuracy limit.

Macro 9 was written by Jim H. Azzola, PhD candidate, MIT 1991, Sloan Auto Lab.

	A	B	C
1	MACRO 9		
2			
3	main	main program indirect calc	h0
4	=RESULT(64)		=RESULT(1)
5	=ARGUMENT("mu",1)		=ARGUMENT("gam2",1)
6	=ARGUMENT("u",1)		=ARGUMENT("a",1)
7	=ARGUMENT("gam2",1)		=ARGUMENT("xr",1)
8	=ARGUMENT("a",1)		=xr^2/(2*a*(gam2-1))
9	=ARGUMENT("w",1)		=RETURN(C8)
10	=ARGUMENT("xr",1)		
11	=SET.VALUE(A12,MACRO9.XLM!h0(gam2,a,xr))		
12	0.000017777777777778	h0	
13	=SET.VALUE(A14,ATAN(xr/SQRT(2*a*A12)))	set non-dimensional x2	
14	0.21998797739546	set non-dimensional x2	
15	=SET.VALUE(A16,w*A12/(12*mu*u*a))		
16	0.081705948372615	w* = nondimensional load	
17	0.0001	epsilon	
18	=SET.VALUE(A20,-0.7)	set initial x1 guess	
19			
20	-0.8999267578125	new x1	
21			
22	=SET.VALUE(A26,A20)	set old val x1	
23			
24	=SET.VALUE(A20,MACRO9.XLM!loc1(A14,A16,A17))	set new value x1	
25			
26	-0.8999267578125	old val x1	
27			
28	=IF(ABS(A20-A26)<=A17,GOTO(A29),GOTO(A22))		
29	=SQRT(2*a*A12)	lambda	
30	=A29*TAN(A20)	Dimensional left value x1	
31			
32	=SET.VALUE(A38,A12)	h0	
33	=SET.VALUE(B38,A30)	x1	
34	=SET.VALUE(C38,MACRO9.XLM!hinfh0(A20,A14)*A12/2)	hinf	
35	=RETURN(A38:C40)	return last values	

	D	E
1		
2		
3	loc1	
4	=RESULT(1)	
5	=ARGUMENT("exr",1)	
6	=ARGUMENT("wstar",1)	
7	=ARGUMENT("eps",1)	epsilon
8		
9		
10	-1.2	initial left value of interval
11	-0.3	initial right value of interval
12	=SET.VALUE(D22,D10)	
13	=SET.VALUE(D23,D11)	
14	=SET.VALUE(D24,0)	zero counter
15	=(D22+D23)/2	initial x
16	=IF(D23-D15<eps,GOTO(D27),GOTO(D17))	
17	=SET.VALUE(D18,MACRO9.XLM!hinfh0(D15,exr))	
18	1.1662557645283	2*hinf/h0 = f from C&E
19	=MACRO9.XLM!K(D15,D18)-MACRO9.XLM!K(exr,D18)+MACRO9.XLM!Ksub1(D15,D18)*(TAN(exr)-TAN(D15))-wstar	f(x left int val)
20	=MACRO9.XLM!K(D23,D18)-MACRO9.XLM!K(exr,D18)+MACRO9.XLM!Ksub1(D23,D18)*(TAN(exr)-TAN(D23))-wstar	f(x right int val)
21	=IF(SIGN(D19)*SIGN(D20)<=0,SET.VALUE(D22,D15),SET.VALUE(D23,D15))	
22	-0.9	left interval val
23	-0.899853515625	right int value
24	12	counter
25	=SET.VALUE(D24,D24+1)	update counter
26	=GOTO(D15)	
27	=RETURN(D15)	
28		
29		
30		
31		
32		
33		
34		
35		

	F	G
1		
2		
3	K	Ksub1
4	=RESULT(1)	=RESULT(1)
5	=ARGUMENT("ex",1)	=ARGUMENT("ex",1)
6	=ARGUMENT("ef",1)	=ARGUMENT("ef",1)
7	=-ex*TAN(ex)/2+ef*(3*ex*TAN(ex)/8-COS(2*ex)/16)	=-ex/2-SIN(2*ex)/4+ef*(3*ex/8+SIN(2*ex)/4+SIN(4*ex)/32)
8	=RETURN(F7)	=RETURN(G7)
9		
10		
11		
12		
13		
14		
15		
16		
17		
18		
19		
20		
21		
22		
23		
24		
25		
26		
27		
28		
29		
30		
31		
32		
33		
34		
35		

	H
1	
2	
3	hinfh0
4	=RESULT(1)
5	=ARGUMENT("exl",1)
6	=ARGUMENT("exr",1)
7	=(exl/2+SIN(2*exl)/4-exr/2-SIN(2*exr)/4)/(3*exl/8+SIN(2*exl)/4+SIN(4*exl)/32-3*exr/8-SIN(2*exr)/4-SIN(4*exr)/32)
8	=RETURN(H7)
9	
10	
11	
12	
13	
14	
15	
16	
17	
18	
19	
20	
21	
22	
23	
24	
25	
26	
27	
28	
29	
30	
31	
32	
33	
34	
35	

	I	J
1		
2		
3	frict	
4	=RESULT(1)	
5	=ARGUMENT("a",1)	
6	=ARGUMENT("b",1)	
7	=ARGUMENT("hsub0",1)	
8	=ARGUMENT("u",1)	
9	=ARGUMENT("mu",1)	
10	=ARGUMENT("hinf",1)	
11	=ARGUMENT("w",1)	
12	=ARGUMENT("xl",1)	dim x1
13	=ARGUMENT("xr",1)	dim x2
14	=SQRT(2*a*hsub0)	
15	=ATAN(xl/I14)	xl ND
16	=ATAN(xr/I14)	xr ND
17	=I15-(0.5*TAN(I15)/(1+(TAN(I15))^2)+I15)*0.5*hinf/hsub0	D(x1)
18	=I16-(0.5*TAN(I16)/(1+(TAN(I16))^2)+I16)*0.5*hinf/hsub0	D(x2)
19	=mu*u*4*a/I14*(I18-I17)	Dr
20	=I19/(u*mu*b/hsub0)	CD
21	=mu*u*b^2/hsub0^2/w	G
22	=(I21)^0.5*I20	
23	=RETURN(I22)	f
24		
25		
26		
27		
28		
29		
30		
31		
32		
33		
34		
35		

Appendix D - Additional Figures

LIST OF FIGURES

KEY

pm - pen multi
ps - pen single
15 - 1500rpm
30 - 3000rpm
M - Wrist pin (McElwee)
B - Skirt (Bliven)

Motored

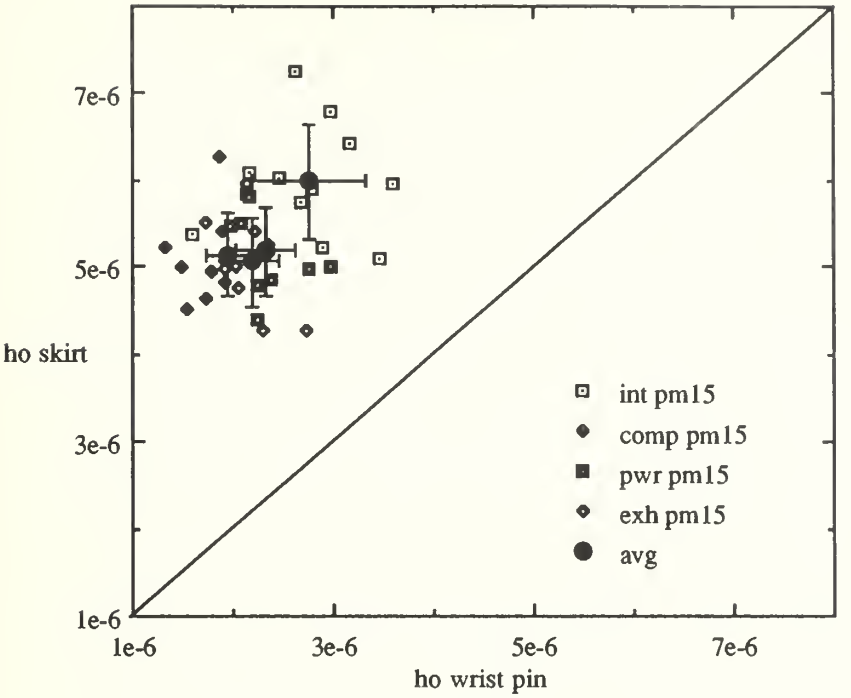
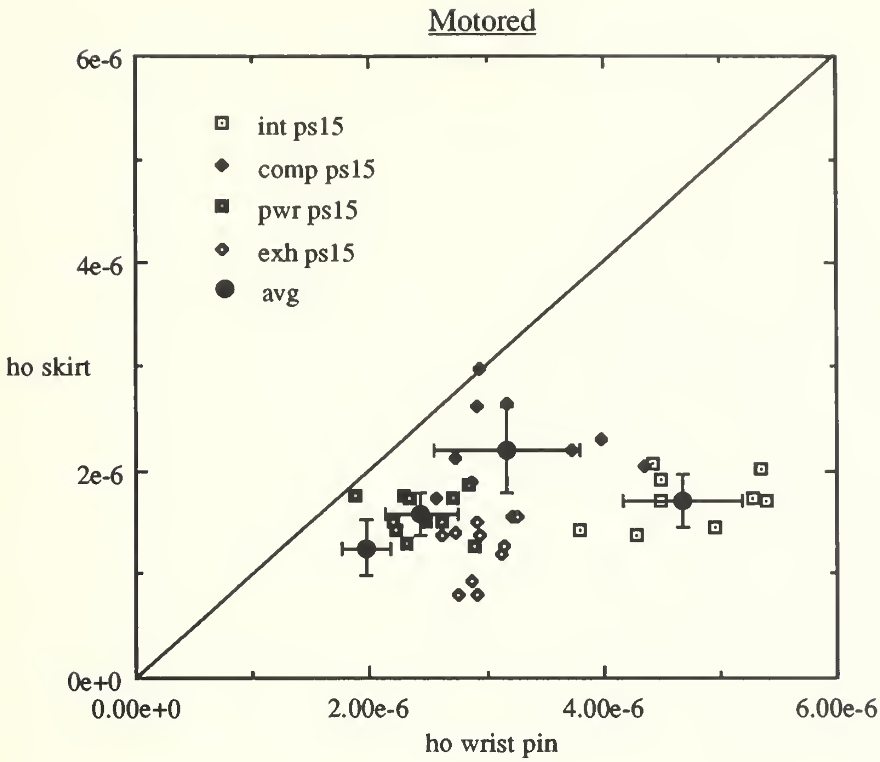


FIG 3A



Motored
6e-6
4e-6
2e-6
0e+0
ho skirt
int ps15
comp ps15
pwr ps15
exh ps15
avg
0.00e+0
2.00e-6
4.00e-6
6.00e-6
ho wrist pin

FIG 3B

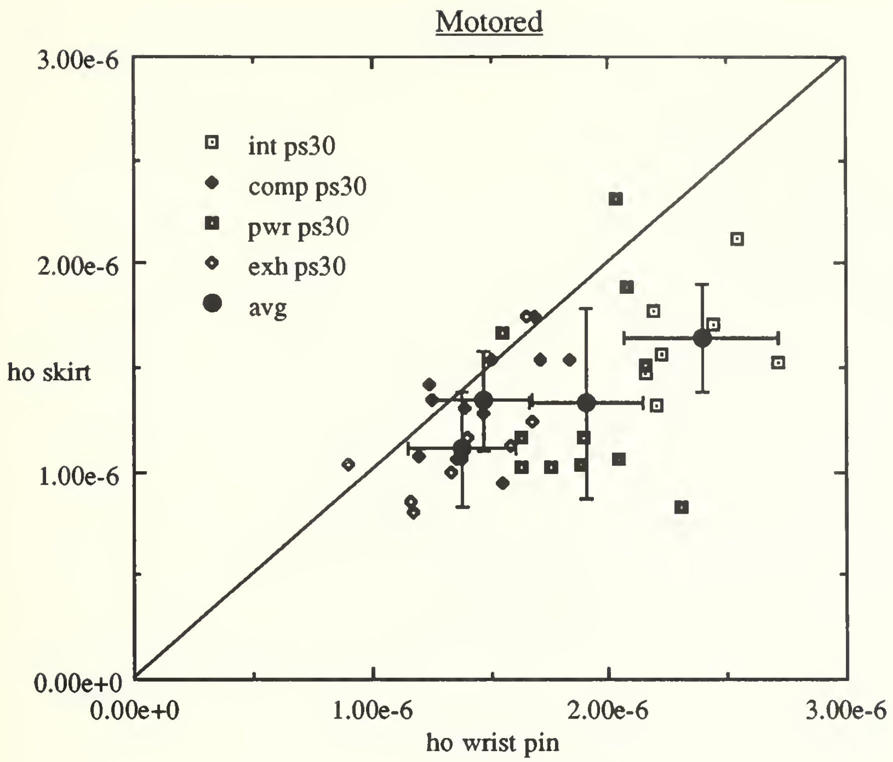

Motored
3.00e-6
2.00e-6
1.00e-6
0.00e+0
int ps30
comp ps30
pwr ps30
exh ps30
avg
ho skirt
0.00e+0
1.00e-6
2.00e-6
3.00e-6
ho wrist pin

FIG 3C

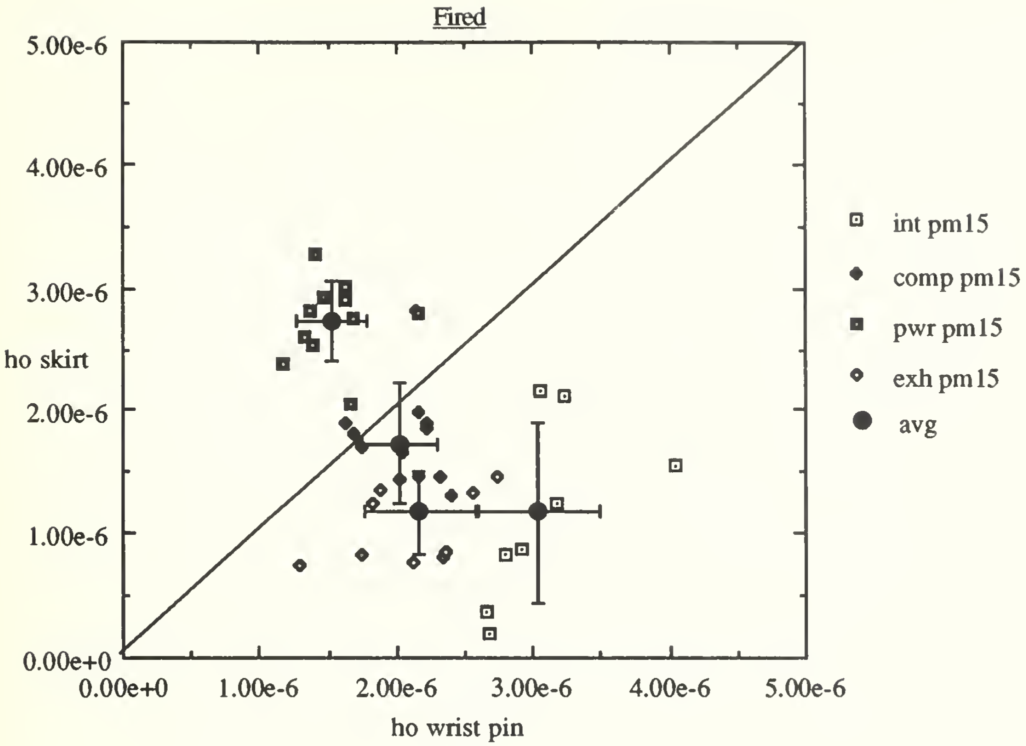

Fired
5.00e-6
4.00e-6
3.00e-6
2.00e-6
1.00e-6
0.00e+0
ho skirt
0.00e+0
1.00e-6
2.00e-6
3.00e-6
4.00e-6
5.00e-6
ho wrist pin
int pm15
comp pm15
pwr pm15
exh pm15
avg

FIG 4A

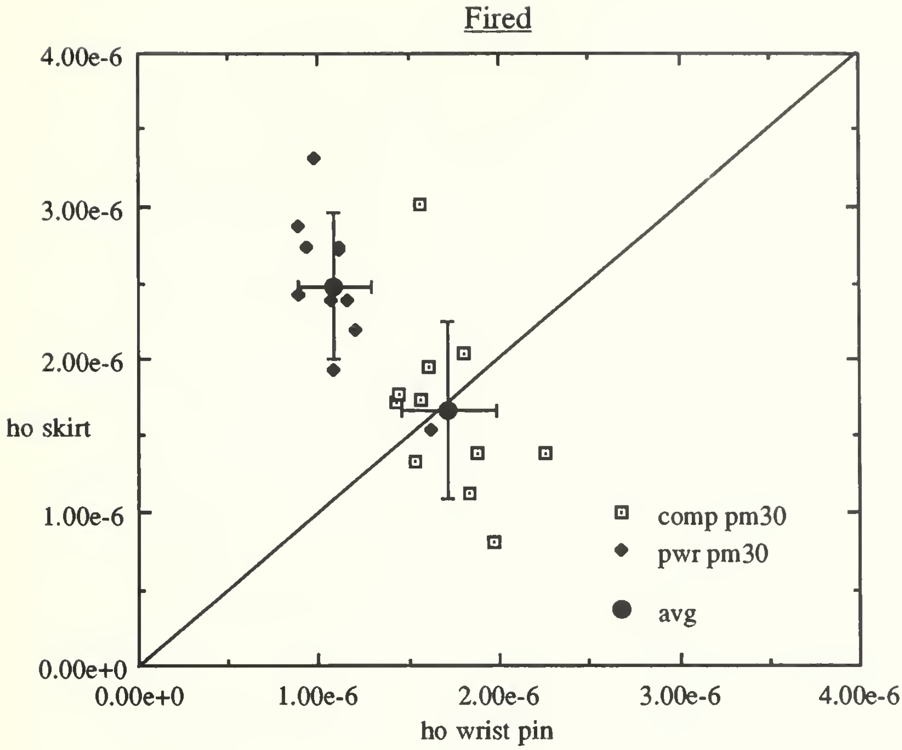

Fired
4.00e-6
3.00e-6
2.00e-6
1.00e-6
0.00e+0
ho skirt
0.00e+0
1.00e-6
2.00e-6
3.00e-6
4.00e-6
ho wrist pin
comp pm30
pwr pm30
avg

FIG 4B

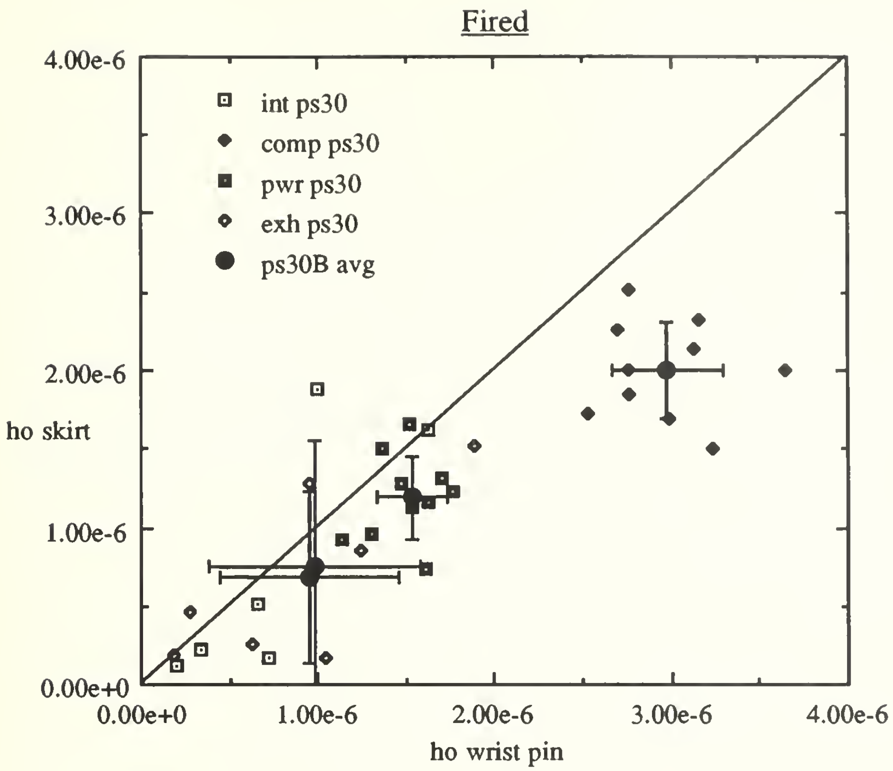

Fired
4.00e-6
3.00e-6
2.00e-6
1.00e-6
0.00e+0
ho skirt
int ps30
comp ps30
pwr ps30
exh ps30
ps30B avg
0.00e+0
1.00e-6
2.00e-6
3.00e-6
4.00e-6
ho wrist pin

FIG 4C

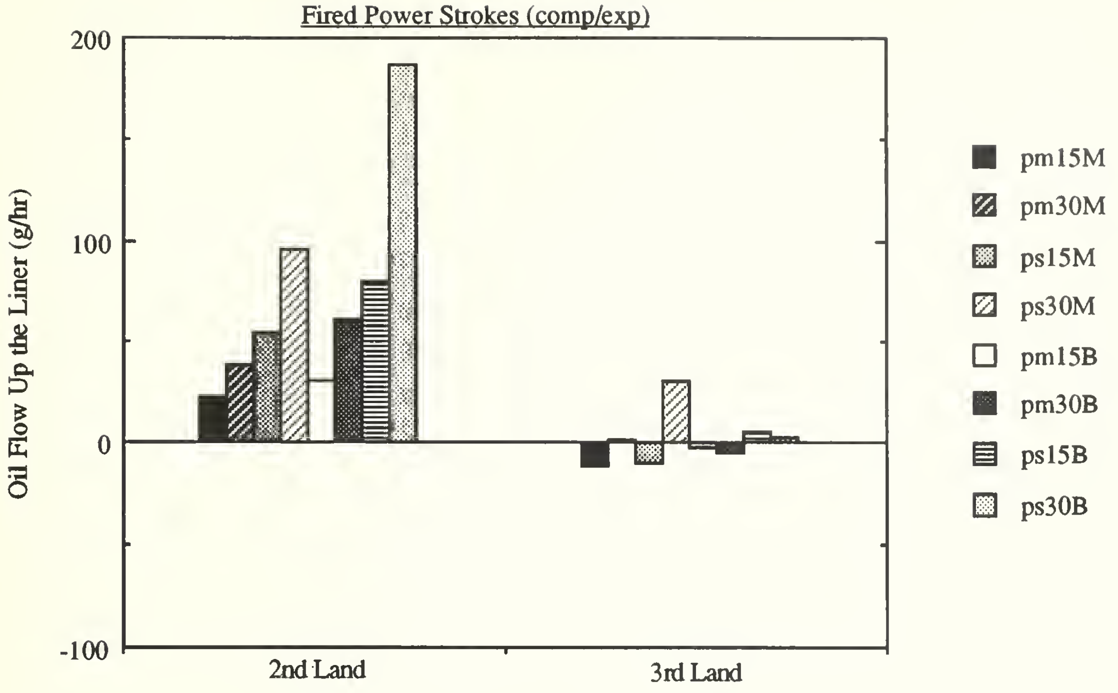

Fired Power Strokes (comp/exp)
200
100
0
-100
Oil Flow Up the Liner (g/hr)
2nd Land
3rd Land
pm15M
pm30M
ps15M
ps30M
pm15B
pm30B
ps15B
ps30B

FIG 5A

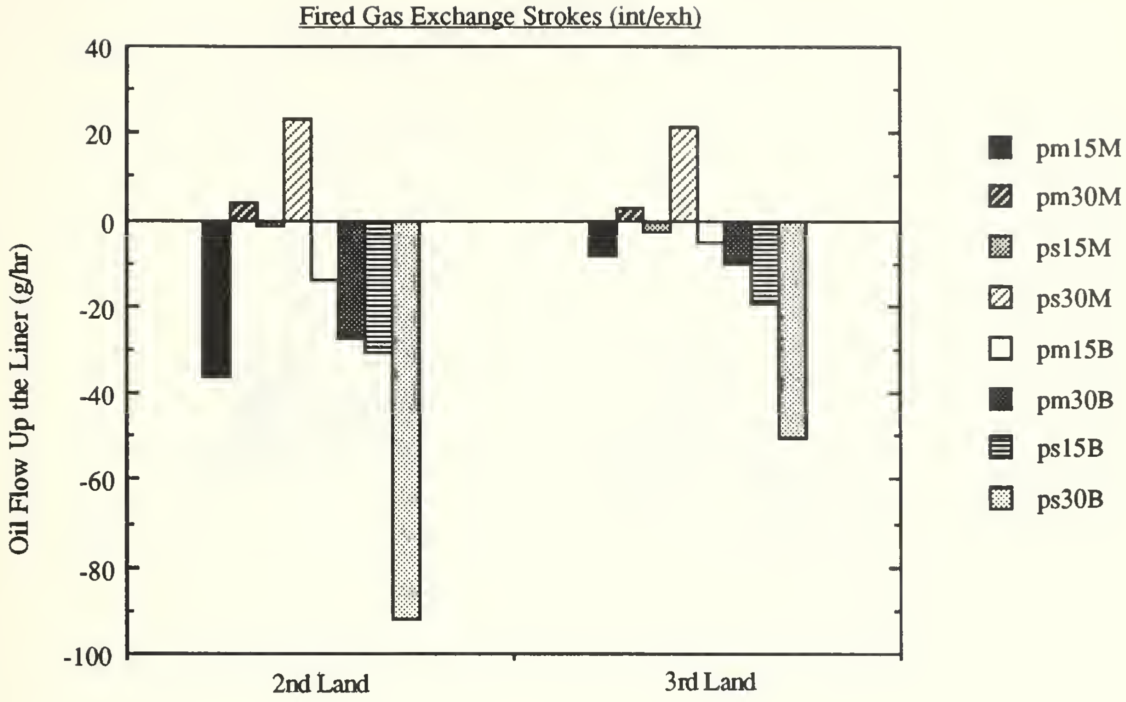

Fired Gas Exchange Strokes (int/exh)
Oil Flow Up the Liner (g/hr)
40
20
0
-20
-40
-60
-80
-100
2nd Land
3rd Land
pm15M
pm30M
ps15M
ps30M
pm15B
pm30B
ps15B
ps30B

FIG 5B

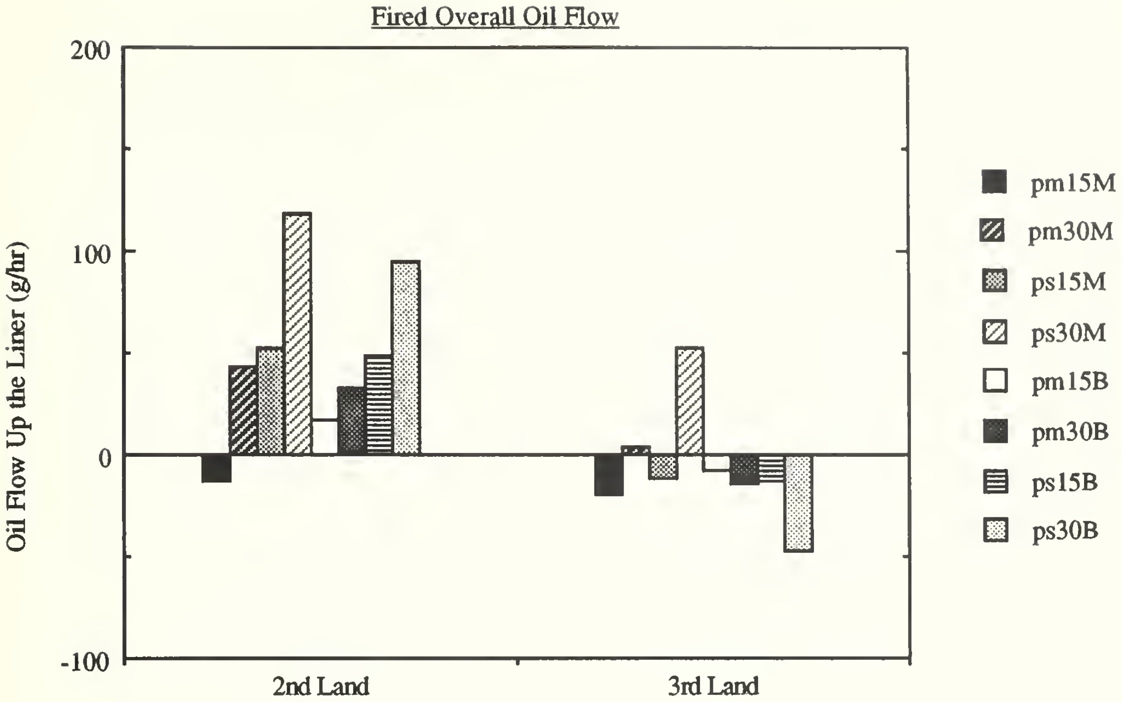

Fired Overall Oil Flow
Oil Flow Up the Liner (g/hr)
200
100
0
-100
2nd Land
3rd Land
pm15M
pm30M
ps15M
ps30M
pm15B
pm30B
ps15B
ps30B

FIG 5C

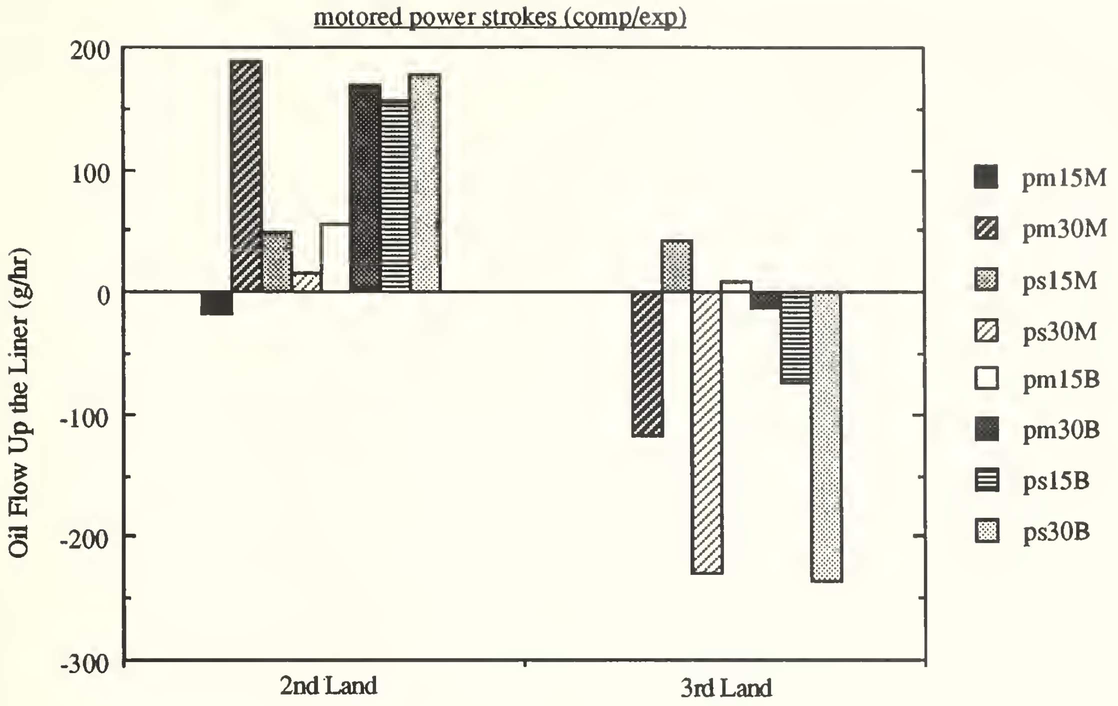

motored power strokes (comp/exp)
200
100
0
-100
-200
-300
Oil Flow Up the Liner (g/hr)
2nd Land
3rd Land
pm15M
pm30M
ps15M
ps30M
pm15B
pm30B
ps15B
ps30B

FIG 5D

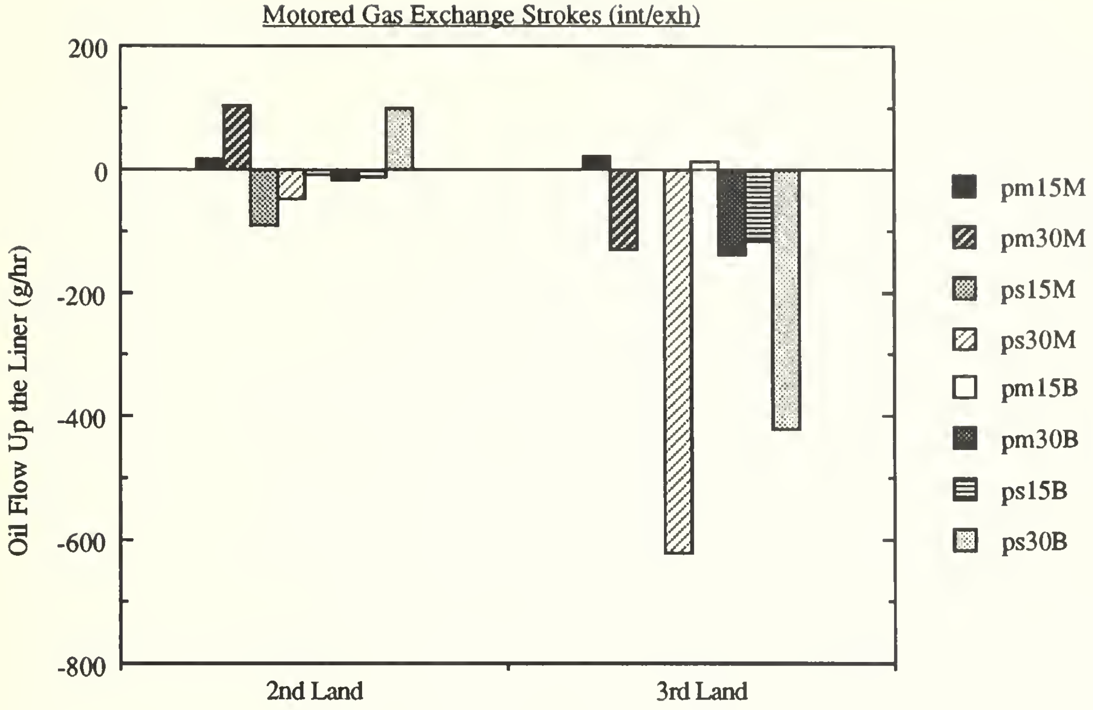

Motored Gas Exchange Strokes (int/exh)
200
0
-200
-400
-600
-800
Oil Flow Up the Liner (g/hr)
2nd Land
3rd Land
pm15M
pm30M
ps15M
ps30M
pm15B
pm30B
ps15B
ps30B

FIG 5E

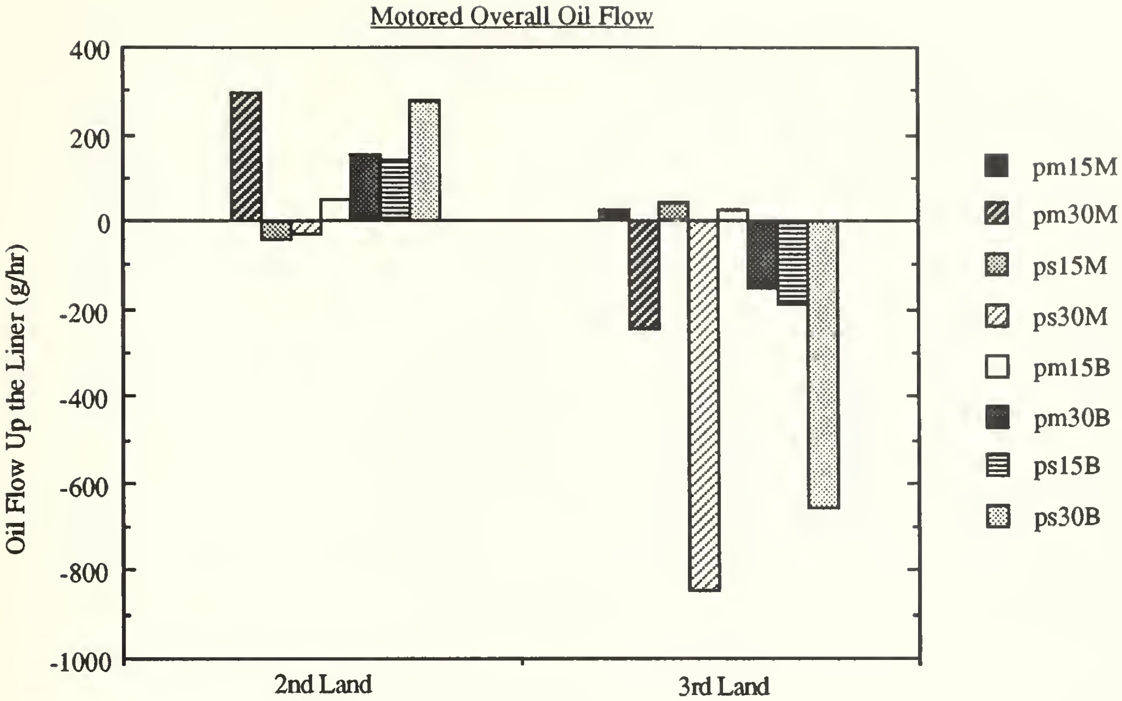

Motored Overall Oil Flow
400
200
0
-200
-400
-600
-800
-1000
Oil Flow Up the Liner (g/hr)
2nd Land
3rd Land
pm15M
pm30M
ps15M
ps30M
pm15B
pm30B
ps15B
ps30B

FIG 5F

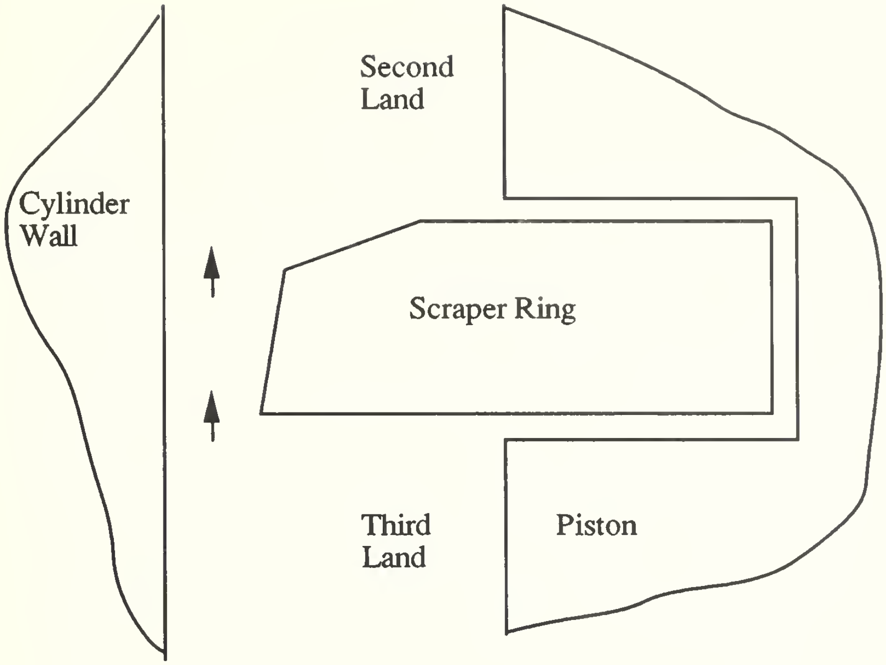


FIG 5G - Oil Flow between ring and liner.

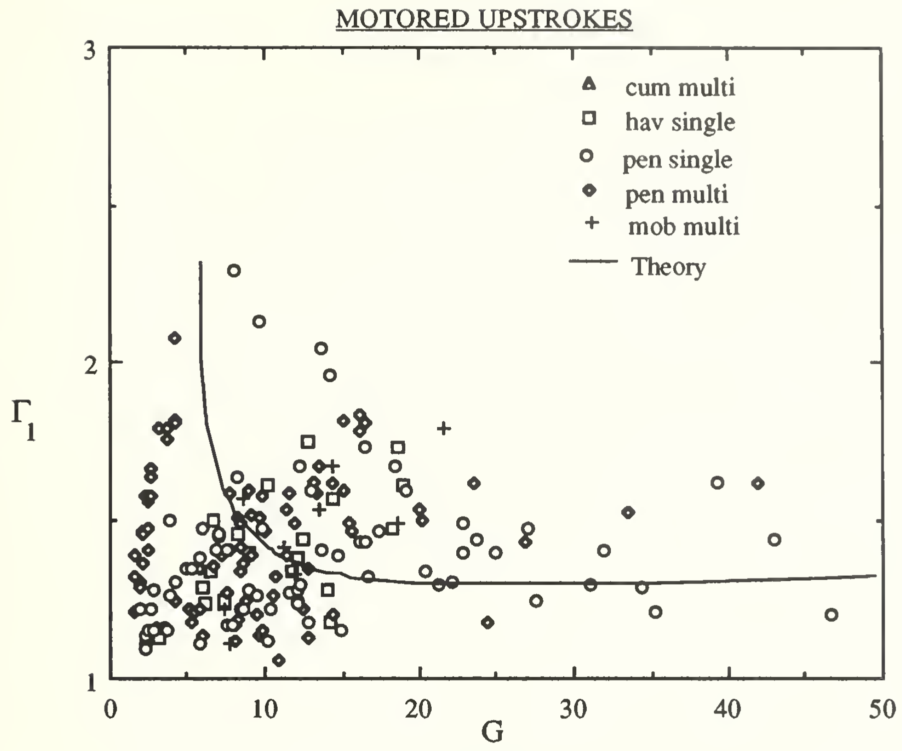

MOTORED UPSTROKES
3
2
1
Γ_1
0
10
20
30
40
50
G
cum multi
hav single
pen single
pen multi
mob multi
Theory

FIG 6A

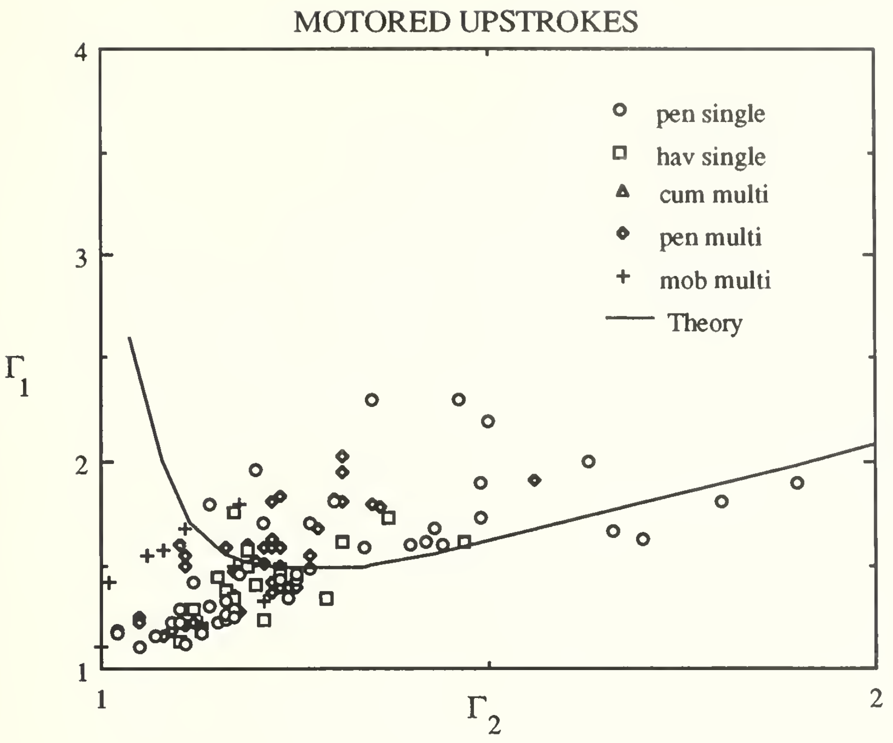

MOTORED UPSTROKES
4
3
2
1
1
2
Γ_1
Γ_2
pen single
hav single
cum multi
pen multi
mob multi
Theory

FIG 7A

Thesis
L79126 Logan
c.1 Oil rheology adjacent
to the scraper ring of a
diesel engine.